



US Army Corps
of Engineers

TECHNICAL REPORT CERC-91-9

2

ANNUAL DATA SUMMARY FOR 1989 CERC FIELD RESEARCH FACILITY

AD-A241 155



Volume II

APPENDIXES C THROUGH E

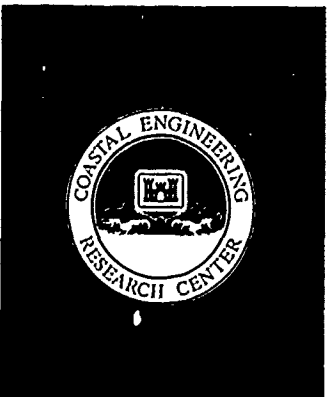
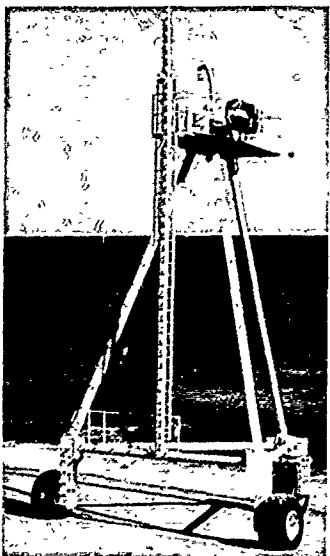
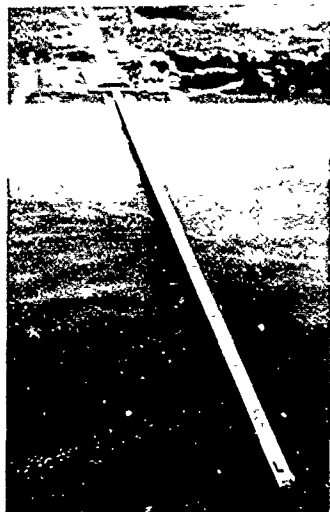
by

Michael W. Leffler, Clifford F. Baron, Brian L. Scarborough
Kent K. Hathaway, Ralph T. Hayes

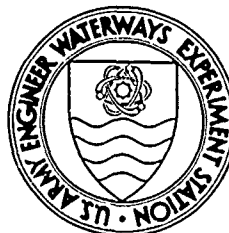
Coastal Engineering Research Center

DEPARTMENT OF THE ARMY

Waterways Experiment Station, Corps of Engineers
3909 Halls Ferry Road, Vicksburg, Mississippi 39180-6199



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August 1991

Final Report

Approved For Public Release; Distribution Unlimited

91-11973



Prepared for DEPARTMENT OF THE ARMY
US Army Corps of Engineers
Washington, DC 20314-1000

Under FRF Analysis Work Unit 32525

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APPENDIX C: WAVE DATA FOR GAGE 111

1. Wave data summaries for Gage 111 are presented for 1989 and for 1985 through 1989 in the following forms:

Daily H_{mo} and T_p

2. Figure C1 displays the individual wave height and peak spectral wave period values along with the monthly mean values.

Joint Distributions of H_{mo} and T_p

3. Annual and monthly joint distributions tables are presented in Tables C1 and C2, and data for 1985 through 1989 are in Tables C3 and C4. Each table gives the frequency (in parts per 10,000) for which the wave height and peak period were within the specified intervals; these values can be converted to percentages by dividing by 100. Marginal totals are also included. The row total gives the total number of observations out of 10,000 that fell within each specified peak period interval. The column total gives the number of observations out of 10,000 that fell within each specified wave height interval.

Cumulative Distributions of Wave Height

4. Annual and monthly wave height distributions for 1989 are plotted in cumulative form in Figures C2 and C3. Data for 1985 through 1989 are in Figure C4.

Peak Spectral Wave Period Distributions

5. Annual and monthly peak wave period, T_p , distribution histograms for 1989 are presented in Figures C5 and C6. Data for 1985 through 1989 are in Figure C7.

Persistence of Wave Heights

6. Table C5 shows the number of times in 1989 when the specified wave height was equaled or exceeded at least once during each day for the duration (consecutive days). Data for 1985 through 1989 are given in Table C6. An example is shown below:

Height m	Consecutive Day(s) or Longer																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19+
0.5	18	15		14	13	12		11	10	9				8		7			
1.0	50	34	24	21	18	14	12	8	7	3			2						
1.5	41	19	8	6	2	1													
2.0	22	9	5	1															
2.5	10	5	2																
3.0	6	1																	
3.5		1																	
4.0	1																		

This example indicates that wave heights equaled or exceeded 1.0 m 50 times for at least 1 day; 34 times for at least 2 days; 24 times for at least 3 days, etc. Therefore, on 16 occasions the height equaled or exceeded 1.0 m for 1 day exactly ($50 - 34 = 16$); on 10 occasions for 2 days; on 3 occasions for 3 days, etc. Note that the height exceeded 1 m 50 times for 1 day or longer, while heights exceeded 0.5 m only 18 times for this same duration. This change in durations occurred because the longer durations of lower waves may be interspersed with shorter, but more frequent, intervals of higher waves. For example, one of the times that the wave heights exceeded 0.5 m for 16 days may have represented 3 times the height exceeded 1 m for shorter durations.

Spectra

7. Monthly spectra for the offshore Waverider buoy (Gage 111) are presented in Figure C8. The plots show "relative" energy density as a function of wave frequency. These figures summarize the large number of spectra for each month. The figures emphasize the higher energy density associated with storms as well as the general shifts in energy density to different frequencies. As used here, "relative" indicates the spectra have been smoothed by the three-dimension surface drawing routine. Consequently, extremely high- and low-energy density values are modified to produce a smooth

9. Figure C9 plots monthly time-histories of wave height and period.



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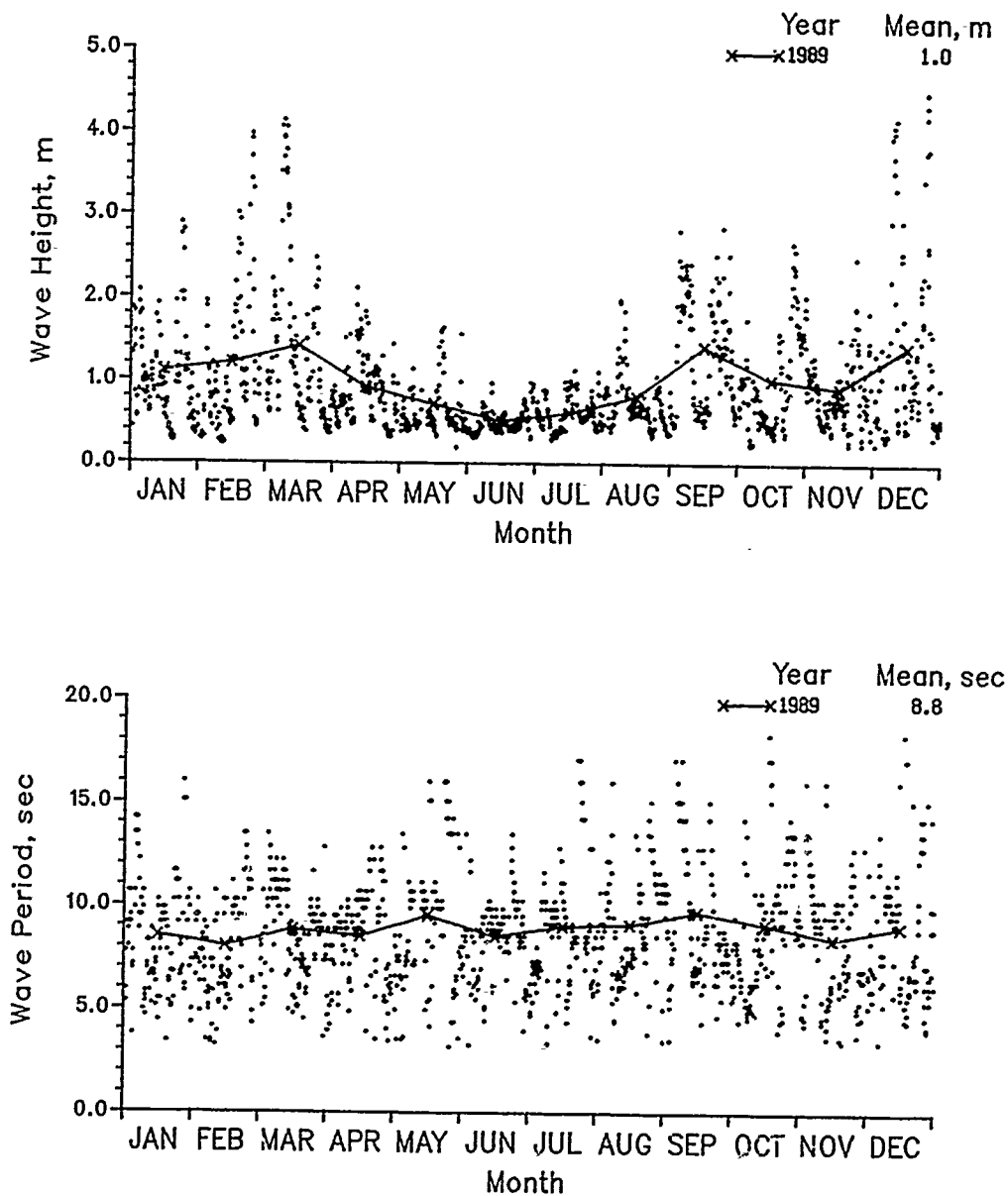


Figure C1. 1989 daily wave height and period values with monthly means for Gage 111

Table C1

Annual Joint Distribution of H_{mo} versus T_p

Annual 1989, Gage 111 Percent Occurrence(X100) of Height and Period													
Height, m	Period, sec												
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	Total
0.00 - 0.49	.	64	28	85	183	212	550	593	480	127	198	14	2534
0.50 - 0.99	.	148	261	480	614	508	649	685	579	127	318	42	4411
1.00 - 1.49	.	7	134	247	282	71	134	155	254	56	78	.	1418
1.50 - 1.99	.	.	7	99	191	85	148	99	120	64	78	7	898
2.00 - 2.49	64	49	35	49	14	49	78	14	352
2.50 - 2.99	7	35	7	35	35	7	28	.	154
3.00 - 3.49	7	14	14	28	7	.	.	70
3.50 - 3.99	7	7	7	56	14	7	.	98
4.00 - 4.49	7	49	.	7	.	63
4.50 - 4.99	0
5.00 - Greater	0
Total	0	219	430	911	1341	974	1544	1644	1615	451	792	77	

Table C2
Monthly Joint Distribution of H_{mo} versus T_p

January 1989, Gage 111 Percent Occurrence(X100) of Height and Period														Total
Height, m	Period, sec													
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer		
0.00 - 0.49	.	83	.	.	83	165	165	909	248	.	.	.	1653	
0.50 - 0.99	.	83	248	496	579	331	248	909	579	165	413	.	4051	
1.00 - 1.49	.	.	165	744	413	248	331	165	413	165	.	.	2644	
1.50 - 1.99	.	.	.	83	331	165	248	83	83	83	.	.	1076	
2.00 - 2.49	83	83	.	.	83	.	.	.	249	
2.50 - 2.99	331	.	.	.	331	
3.00 - 3.49	0	
3.50 - 3.99	0	
4.00 - 4.49	0	
4.50 - 4.99	0	
5.00 - Greater	0	
Total	0	166	413	1323	1489	992	992	2066	1737	413	413	0		

February 1989, Gage 111													
Percent Occurrence(X100) of Height and Period													
Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	.	190	95	.	190	286	190	857	762	.	.	.	2570
0.50 - 0.99	.	286	286	476	762	476	286	286	476	.	.	.	3334
1.00 - 1.49	.	.	190	286	286	190	95	286	190	.	.	.	1523
1.50 - 1.99	.	.	.	286	286	190	.	190	190	.	.	.	1142
2.00 - 2.49	95	95	.	.	.	.	190	.	380
2.50 - 2.99	95	95	.	190	.	.	.	.	380
3.00 - 3.49	190	95	.	95	.	.	390
3.50 - 3.99	190	95	.	.	235
4.00 - 4.49	0
4.50 - 4.99	0
5.00 - Greater	0
Total	0	476	571	1048	1714	1332	761	1904	1808	190	190	0	

March 1989, Gage 111													
Percent Occurrence(X100) of Height and Period													
Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	.	.	.	81	.	.	732	163	.	.	81	.	1057
0.50 - 0.99	.	81	81	407	163	894	1057	650	488	.	.	.	3821
1.00 - 1.49	.	.	163	244	244	81	81	163	650	.	81	.	1707
1.50 - 1.99	.	.	.	163	407	163	.	163	325	81	81	.	1383
2.00 - 2.49	163	.	244	244	.	.	81	.	732
2.50 - 2.99	163	81	.	.	.	244
3.00 - 3.49	81	244	.	.	.	325
3.50 - 3.99	407	.	81	.	488
4.00 - 4.49	244	.	.	.	244
4.50 - 4.99	0
5.00 - Greater	0
Total	0	81	244	895	977	1138	2114	1627	2439	81	405	0	

(Continued)

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Table C2 (Continued)

April 1989, Gage 111
Percent Occurrence(X100) of Height and Period

Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	.	.	.	508	.	169	254	339	593	.	169	.	2032
0.50 - 0.99	.	254	254	254	424	424	678	1441	678	.	424	.	4831
1.00 - 1.49	.	85	85	169	254	85	169	424	339	.	254	.	1864
1.50 - 1.99	.	.	85	169	85	254	339	85	169	.	.	.	1186
2.00 - 2.49	85	.	.	.	.	.	.	.	85
2.50 - 2.99	0
3.00 - 3.49	0
3.50 - 3.99	0
4.00 - 4.49	0
4.50 - 4.99	0
5.00 - Greater	0
Total	0	339	424	1100	848	932	1440	2289	1779	0	847	0	

May 1989, Gage 111
Percent Occurrence(X100) of Height and Period

Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	.	180	90	90	450	450	541	180	811	901	991	.	4684
0.50 - 0.99	.	270	360	450	360	901	360	450	541	180	360	.	4232
1.00 - 1.49	90	.	.	180	360	.	.	.	630
1.50 - 1.99	.	.	.	90	.	.	.	90	270	.	.	.	450
2.00 - 2.49	0
2.50 - 2.99	0
3.00 - 3.49	0
3.50 - 3.99	0
4.00 - 4.49	0
4.50 - 4.99	0
5.00 - Greater	0
Total	0	450	450	630	900	1351	901	900	1982	1081	1351	0	

June 1989, Gage 111
Percent Occurrence(X100) of Height and Period

Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	.	83	.	83	500	500	2583	1583	417	167	167	.	6093
0.50 - 0.99	.	83	83	917	500	83	833	1000	333	.	83	.	3915
1.00 - 1.49	0
1.50 - 1.99	0
2.00 - 2.49	0
2.50 - 2.99	0
3.00 - 3.49	0
3.50 - 3.99	0
4.00 - 4.49	0
4.50 - 4.99	0
5.00 - Greater	0
Total	0	166	83	1000	1000	583	3416	2583	750	167	250	0	

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Table C2 (Continued)

July 1989, Gage 111
Percent Occurrence(X100) of Height and Period

Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	.	83	83	.	333	167	833	1250	333	.	250	.	3332
0.50 - 0.99	.	83	333	667	1083	583	1250	583	583	500	583	167	6415
1.00 - 1.49	.	.	.	83	83	.	.	.	83	.	.	.	249
1.50 - 1.99	0
2.00 - 2.49	0
2.50 - 2.99	0
3.00 - 3.49	0
3.50 - 3.99	0
4.00 - 4.49	0
4.50 - 4.99	0
5.00 - Greater	0
Total	0	166	416	750	1499	750	2033	1833	999	500	833	167	

August 1989, Gage 111
Percent Occurrence(X100) of Height and Period

Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	83	83	579	496	826	83	.	.	2150
0.50 - 0.99	.	248	83	331	744	1322	1074	413	1240	413	826	.	6694
1.00 - 1.49	.	.	83	83	331	.	.	83	83	83	83	.	829
1.50 - 1.99	.	.	.	165	165	.	.	.	.	.	.	.	330
2.00 - 2.49	0
2.50 - 2.99	0
3.00 - 3.49	0
3.50 - 3.99	0
4.00 - 4.49	0
4.50 - 4.99	0
5.00 - Greater	0
Total	0	248	166	579	1323	1405	1653	992	2149	579	909	0	

September 1989, Gage 111
Percent Occurrence(X100) of Height and Period

Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	83	83	.	167	.	83	.	416
0.50 - 0.99	.	83	.	.	917	750	667	500	583	.	167	.	3657
1.00 - 1.49	.	.	167	167	250	83	417	250	250	83	167	.	1834
1.50 - 1.99	.	.	.	167	417	.	583	.	83	250	500	83	2083
2.00 - 2.49	333	167	83	.	500	417	167	1657
2.50 - 2.99	167	83	.	.	.	83	.	333
3.00 - 3.49	0
3.50 - 3.99	0
4.00 - 4.49	0
4.50 - 4.99	0
5.00 - Greater	0
Total	0	83	167	334	1584	1416	2000	833	1083	833	1417	250	

(Continued)

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Table C2 (Concluded)

October 1989, Gage 111
Percent Occurrence(X100) of Height and Period

Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- longer	
0.00 - 0.49	242	323	403	403	645	242	81	161	2500
0.50 - 0.99	.	81	403	484	1048	81	565	403	242	.	242	81	3630
1.00 - 1.49	.	.	323	323	81	161	161	81	242	81	161	.	1614
1.50 - 1.99	81	.	484	323	161	323	242	.	1614
2.00 - 2.49	161	81	81	161	.	484
2.50 - 2.99	161	.	161
3.00 - 3.49	0
3.50 - 3.99	0
4.00 - 4.49	0
4.50 - 4.99	0
5.00 - Greater	0
Total	0	81	726	807	1452	565	1613	1371	1371	727	1048	242	

November 1989, Gage 111
Percent Occurrence(X100) of Height and Period

Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- longer	
0.00 - 0.49	.	83	.	.	83	83	167	500	750	.	333	.	1999
0.50 - 0.99	.	250	667	750	500	167	333	1000	833	83	333	.	4916
1.00 - 1.49	.	.	333	333	583	.	333	250	250	167	167	.	2416
1.50 - 1.99	250	83	83	167	.	.	.	.	583
2.00 - 2.49	83	.	.	.	.	.	.	.	83
2.50 - 2.99	0
3.00 - 3.49	0
3.50 - 3.99	0
4.00 - 4.49	0
4.50 - 4.99	0
5.00 - Greater	0
Total	0	333	1000	1083	1499	333	916	1917	1833	250	833	0	

December 1989, Gage 111
Percent Occurrence(X100) of Height and Period

Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- longer	
0.00 - 0.49	.	88	88	263	263	263	.	439	263	175	263	.	2105
0.50 - 0.99	.	.	351	526	263	88	351	526	351	175	351	263	3245
1.00 - 1.49	.	.	88	526	789	.	.	.	175	83	.	.	1666
1.50 - 1.99	.	.	.	88	263	175	.	88	175	.	88	.	877
2.00 - 2.49	263	88	.	88	.	.	88	.	527
2.50 - 2.99	175	.	88	.	88	88	.	439
3.00 - 3.49	88	.	.	88	.	.	.	176
3.50 - 3.99	88	88	88	88	88	.	.	450
4.00 - 4.49	88	351	.	88	.	527
4.50 - 4.99	0
5.00 - Greater	0
Total	0	88	527	1403	1841	965	439	1405	1491	614	956	263	

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Table C3
Annual Joint Distribution of H_{∞} versus T_p (All Years)

Annual 1985-1989, Gage 111 Percent Occurrence(X100) of Height and Period													
Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	9	72	38	70	128	224	688	446	389	163	261	6	2494
0.50 - 0.99	4	142	239	466	535	405	941	751	548	139	289	13	4472
1.00 - 1.49	.	13	132	375	298	152	242	199	246	29	89	.	1775
1.50 - 1.99	.	.	10	120	180	73	85	67	120	34	60	3	752
2.00 - 2.49	.	.	.	6	44	40	40	40	54	23	34	3	284
2.50 - 2.99	.	.	.	.	4	12	7	13	37	9	21	.	103
3.00 - 3.49	.	.	.	.	3	7	10	16	13	4	4	.	57
3.50 - 3.99	.	.	.	.	.	1	7	3	16	4	3	.	34
4.00 - 4.49	.	.	.	.	.	.	1	3	12	.	4	.	20
4.50 - 4.99	.	.	.	.	.	.	.	.	3	.	.	.	3
5.00 - Greater	.	.	.	.	.	.	.	.	.	.	.	.	0
Total	13	227	419	1037	1192	914	2021	1538	1438	405	765	25	

Table C4
Monthly Joint Distribution of H_{mo} versus T_p (All Years)

January 1985-1989, Gage 111 Percent Occurrence(X100) of Height and Period													
Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	.	117	17	17	34	185	453	587	369	168	268	17	2232
0.50 - 0.99	.	168	235	436	436	302	721	470	654	84	268	.	3774
1.00 - 1.49	.	17	218	654	436	185	252	268	268	34	50	.	2382
1.50 - 1.99	.	.	.	168	369	101	117	84	67	34	17	.	957
2.00 - 2.49	134	117	84	17	50	.	34	.	436
2.50 - 2.99	17	.	34	.	134	.	.	.	185
3.00 - 3.49	17	.	.	.	17
3.50 - 3.99	17	.	.	.	17
4.00 - 4.49	0
4.50 - 4.99	0
5.00 - Greater	0
Total	0	302	470	1275	1426	890	1661	1426	1576	320	637	17	

February 1985-1989, Gage 111 Percent Occurrence(X100) of Height and Period													
Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	.	56	56	19	93	75	168	355	280	37	168	.	1307
0.50 - 0.99	.	150	224	486	579	393	748	841	766	93	187	19	4486
1.00 - 1.49	.	.	150	636	467	206	262	374	355	19	187	.	2656
1.50 - 1.99	.	.	19	168	299	112	56	93	168	.	19	.	934
2.00 - 2.49	.	.	.	19	37	19	19	37	56	.	37	.	224
2.50 - 2.99	19	19	.	56	19	.	56	.	169
3.00 - 3.49	19	.	37	75	.	19	.	.	150
3.50 - 3.99	19	37	19	.	.	75
4.00 - 4.49	0
4.50 - 4.99	0
5.00 - Greater	0
Total	0	206	449	1328	1513	824	1290	1850	1681	187	654	19	

March 1985-1989, Gage 111 Percent Occurrence(X100) of Height and Period													
Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	17	.	.	83	50	99	413	215	231	66	83	.	1257
0.50 - 0.99	.	66	116	495	495	495	1073	1023	677	50	50	.	4540
1.00 - 1.49	.	17	182	380	413	165	198	281	528	.	33	.	2197
1.50 - 1.99	.	.	17	132	198	132	99	83	198	17	99	.	975
2.00 - 2.49	66	17	83	132	116	.	99	.	513
2.50 - 2.99	50	83	17	50	.	200
3.00 - 3.49	17	66	.	.	.	83
3.50 - 3.99	17	.	99	17	17	.	150
4.00 - 4.49	50	.	33	.	83
4.50 - 4.99	17	.	.	.	17
5.00 - Greater	0
Total	17	83	315	1090	1222	908	1883	1801	2065	167	464	0	

(Continued)

(Sheet 1 of 4)

Table C4 (Continued)

April 1985-1989, Gage 111
Percent Occurrence(X100) of Height and Period

Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	17			104	17	69	485	347	433	277	295	.	2044
0.50 - 0.99	.	191	191	295	468	312	849	988	607	295	555	17	4768
1.00 - 1.49	.	17	35	156	277	104	364	416	139	.	121	.	1629
1.50 - 1.99	.	.	35	121	121	87	121	69	295	35	104	.	988
2.00 - 2.49	.	.	.	17	35	.	.	87	87	.	35	.	261
2.50 - 2.99	52	52	.	.	104
3.00 - 3.49	17	.	17	17	17	17	17	.	102
3.50 - 3.99	17	17	17	.	17	.	51
4.00 - 4.49	17	17	.	.	.	.	34
4.50 - 4.99	17	.	.	.	17
5.00 - Greater	0
Total	17	208	261	693	935	572	1870	1941	1664	676	1144	17	

May 1985-1989, Gage 111
Percent Occurrence(X100) of Height and Period

Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	18	89	36	125	231	214	872	374	391	302	445	.	3097
0.50 - 0.99	.	125	214	285	534	552	1174	694	498	53	231	.	4360
1.00 - 1.49	.	.	18	178	125	160	516	196	214	.	107	.	1514
1.50 - 1.99	.	.	18	71	36	18	107	89	160	53	89	18	659
2.00 - 2.49	18	18	18	18	18	71	36	.	197
2.50 - 2.99	18	.	.	.	36	18	53	.	125
3.00 - 3.49	18	36	.	54
3.50 - 3.99	0
4.00 - 4.49	0
4.50 - 4.99	0
5.00 - Greater	0
Total	18	214	286	659	962	962	2687	1371	1317	515	997	18	

June 1985-1989, Gage 111
Percent Occurrence(X100) of Height and Period

Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	34	239	51	102	392	563	1724	751	392	222	239	.	4709
0.50 - 0.99	17	137	239	427	495	290	1280	956	205	154	34	.	4234
1.00 - 1.49	.	17	68	137	239	119	102	34	68	.	17	.	801
1.50 - 1.99	.	.	17	34	34	34	34	17	34	.	.	.	204
2.00 - 2.49	.	.	.	.	.	.	34	.	17	.	.	.	51
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	.	.	.	.	.	.	.	.	.	.	.	.	0
Total	51	393	375	700	1160	1006	3174	1758	716	376	290	0	

(Continued)

(Sheet 2 of 4)

Table C4 (Continued)

July 1985-1989, Gage 111
Percent Occurrence(X100) of Height and Period

Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	17	69	104	35	260	608	1823	955	660	243	486	17	5277
0.50 - 0.99	.	226	313	434	382	538	1337	469	226	139	226	35	4325
1.00 - 1.49	.	.	52	87	69	17	17	17	52	.	.	.	311
1.50 - 1.99	17	17	35	17	.	.	.	.	86
2.00 - 2.49	0
2.50 - 2.99	0
3.00 - 3.49	0
3.50 - 3.99	0
4.00 - 4.49	0
4.50 - 4.99	0
5.00 - Greater	0
Total	17	295	469	556	728	1180	3212	1458	938	382	712	52	0

August 1985-1989, Gage 111
Percent Occurrence(X100) of Height and Period

Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	.	72	54	108	199	271	939	505	487	126	144	.	2905
0.50 - 0.99	.	235	126	848	830	415	1029	578	433	253	433	.	5180
1.00 - 1.49	.	.	199	379	181	90	253	54	126	36	36	.	1354
1.50 - 1.99	.	.	.	144	72	36	.	36	36	72	.	.	396
2.00 - 2.49	18	.	36	72	18	.	.	144
2.50 - 2.99	18	.	.	.	.	.	18
3.00 - 3.49	0
3.50 - 3.99	0
4.00 - 4.49	0
4.50 - 4.99	0
5.00 - Greater	0
Total	0	307	379	1479	1282	830	2239	1209	1154	505	613	0	0

September 1985-1989, Gage 111
Percent Occurrence(X100) of Height and Period

Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	.	.	18	18	18	147	312	257	587	37	275	.	1669
0.50 - 0.99	.	73	128	312	624	440	881	1028	789	165	275	.	4715
1.00 - 1.49	.	18	73	275	257	294	440	239	275	110	128	.	2109
1.50 - 1.99	.	.	.	128	220	165	202	37	55	55	110	18	990
2.00 - 2.49	37	110	37	18	.	110	92	37	441
2.50 - 2.99	37	18	.	.	.	18	.	73
3.00 - 3.49	0
3.50 - 3.99	0
4.00 - 4.49	0
4.50 - 4.99	0
5.00 - Greater	0
Total	0	91	219	733	1156	1193	1890	1579	1706	477	898	55	0

(Continued)

(Sheet 3 of 4)

Table C4 (Concluded)

October 1985-1989, Gage 111
Percent Occurrence(X100) of Height and Period

Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	.	.	34	17	68	136	271	254	254	136	186	34	1390
0.50 - 0.99	.	85	322	373	627	322	915	729	678	68	424	17	4560
1.00 - 1.49	.	17	322	458	153	102	119	271	492	17	136	.	2087
1.50 - 1.99	.	.	17	237	237	34	169	153	220	85	102	.	1254
2.00 - 2.49	51	68	34	51	136	17	34	.	391
2.50 - 2.99	34	17	17	68	.	34	.	170
3.00 - 3.49	34	68	34	.	.	.	.	136
3.50 - 3.99	17	.	.	.	.	.	17
4.00 - 4.49	0
4.50 - 4.99	0
5.00 - Greater	0
Total	0	102	695	1085	1136	730	1610	1509	1848	323	916	51	

November 1985-1989, Gage 111
Percent Occurrence(X100) of Height and Period

Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	.	52	52	70	35	192	385	227	280	105	210	.	1608
0.50 - 0.99	17	157	420	577	577	455	752	577	490	175	402	.	4599
1.00 - 1.49	.	17	227	629	472	280	297	105	157	87	157	.	2428
1.50 - 1.99	.	.	.	140	262	87	70	87	105	.	35	.	786
2.00 - 2.49	.	.	.	35	35	87	157	52	70	.	.	.	436
2.50 - 2.99	17	.	17	.	.	.	.	34
3.00 - 3.49	17	.	35	35	.	.	.	87
3.50 - 3.99	0
4.00 - 4.49	17	.	.	.	17
4.50 - 4.99	0
5.00 - Greater	0
Total	17	226	699	1451	1381	1135	1661	1100	1154	367	804	0	

December 1985-1989, Gage 111
Percent Occurrence(X100) of Height and Period

Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	.	173	38	154	134	115	345	518	307	230	345	.	2359
0.50 - 0.99	19	96	345	653	384	345	480	653	576	154	403	77	4185
1.00 - 1.49	.	38	19	557	499	115	96	134	269	58	115	.	1900
1.50 - 1.99	.	.	.	96	307	58	.	38	96	58	154	.	807
2.00 - 2.49	115	19	.	19	19	77	38	.	287
2.50 - 2.99	38	.	19	38	19	38	.	152
3.00 - 3.49	38	.	19	19	.	.	.	76
3.50 - 3.99	19	38	19	19	19	.	.	114
4.00 - 4.49	19	77	.	19	.	115
4.50 - 4.99	0
5.00 - Greater	0
Total	19	307	402	1460	1439	747	959	1438	1420	615	1112	77	

(Sheet 4 of 4)

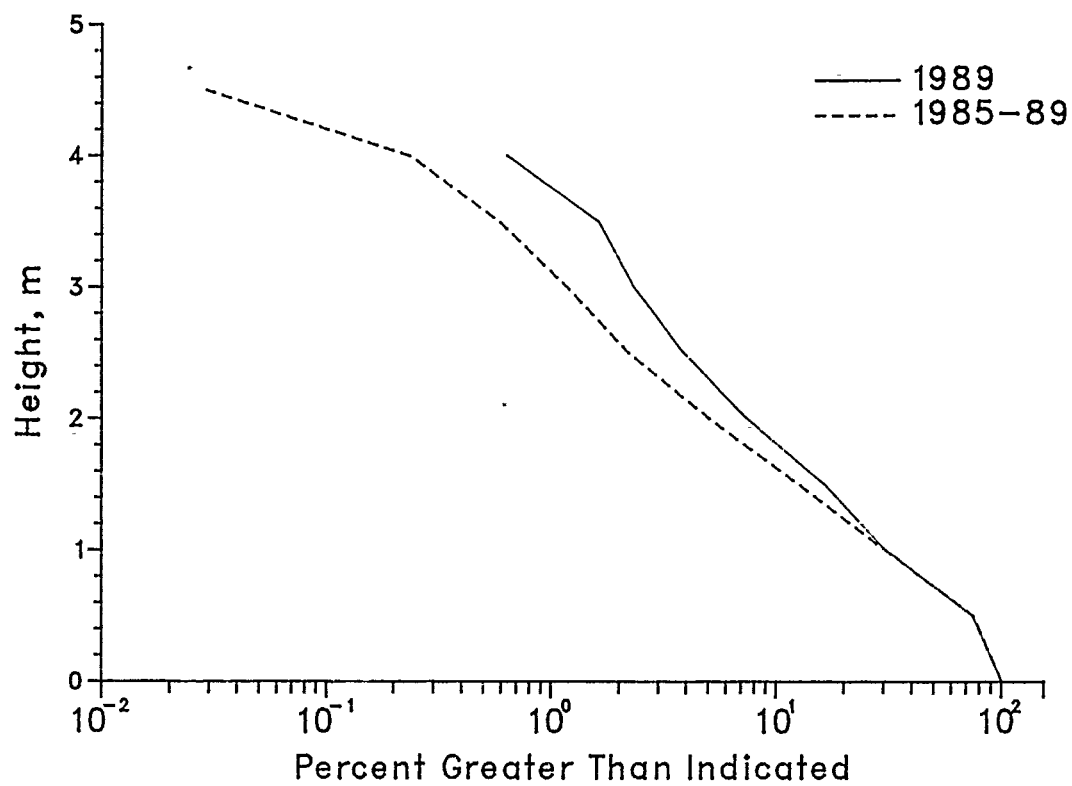


Figure C2. Annual cumulative wave height distributions
for Gage 111

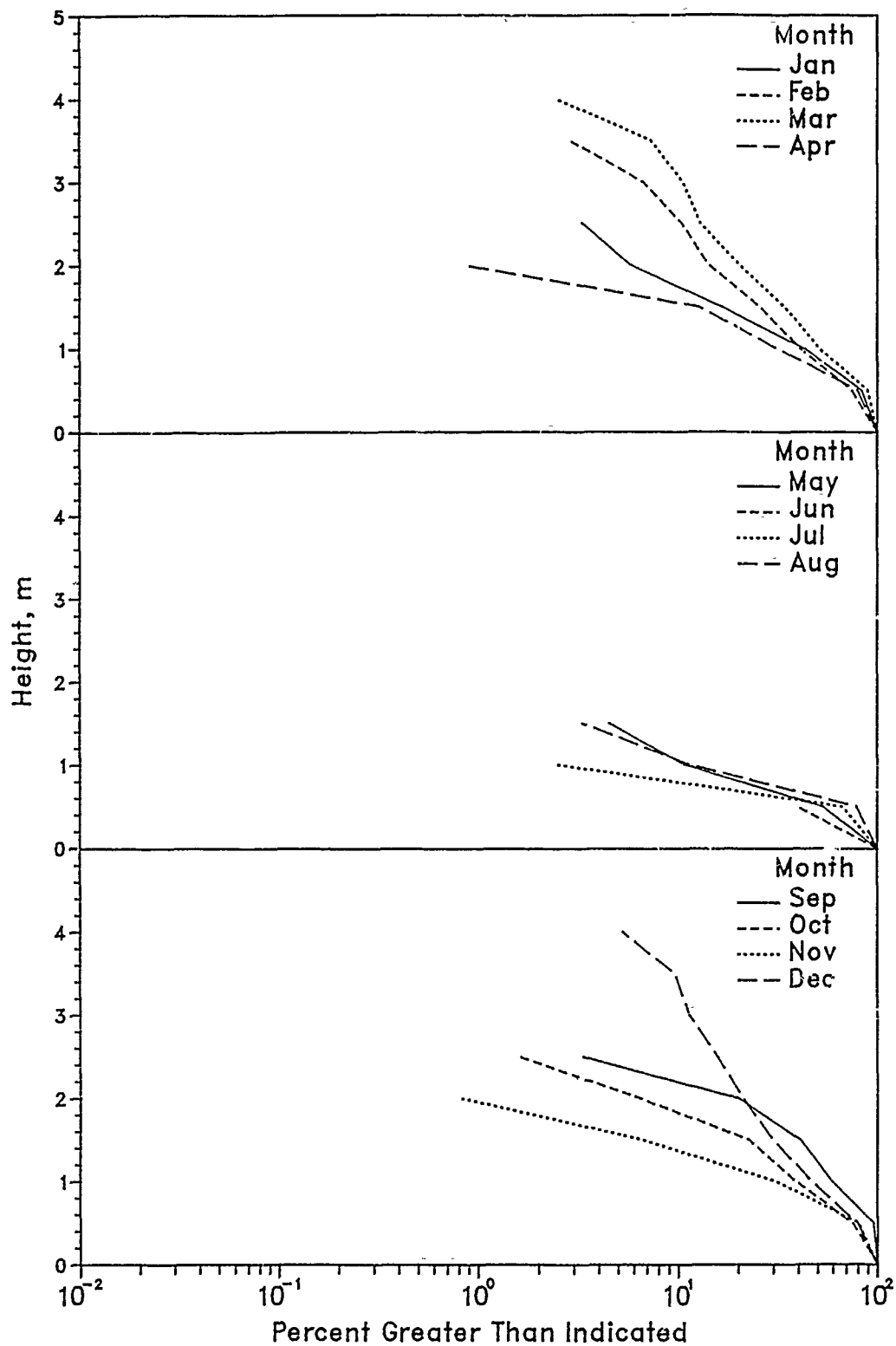


Figure C3. 1989 monthly wave height distributions
for Gage 111

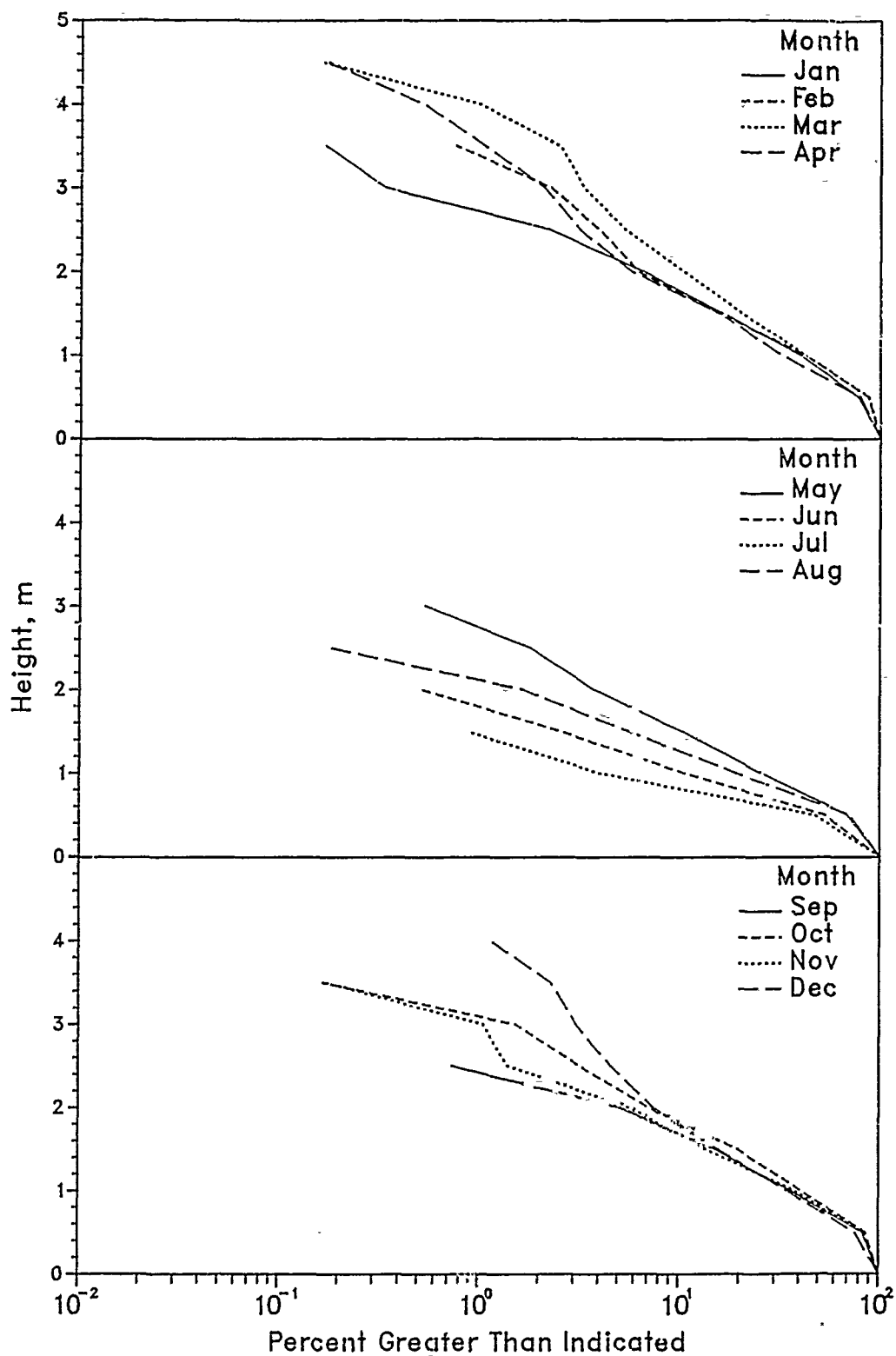


Figure C4. 1985-1989 monthly wave height distributions for Gage 111

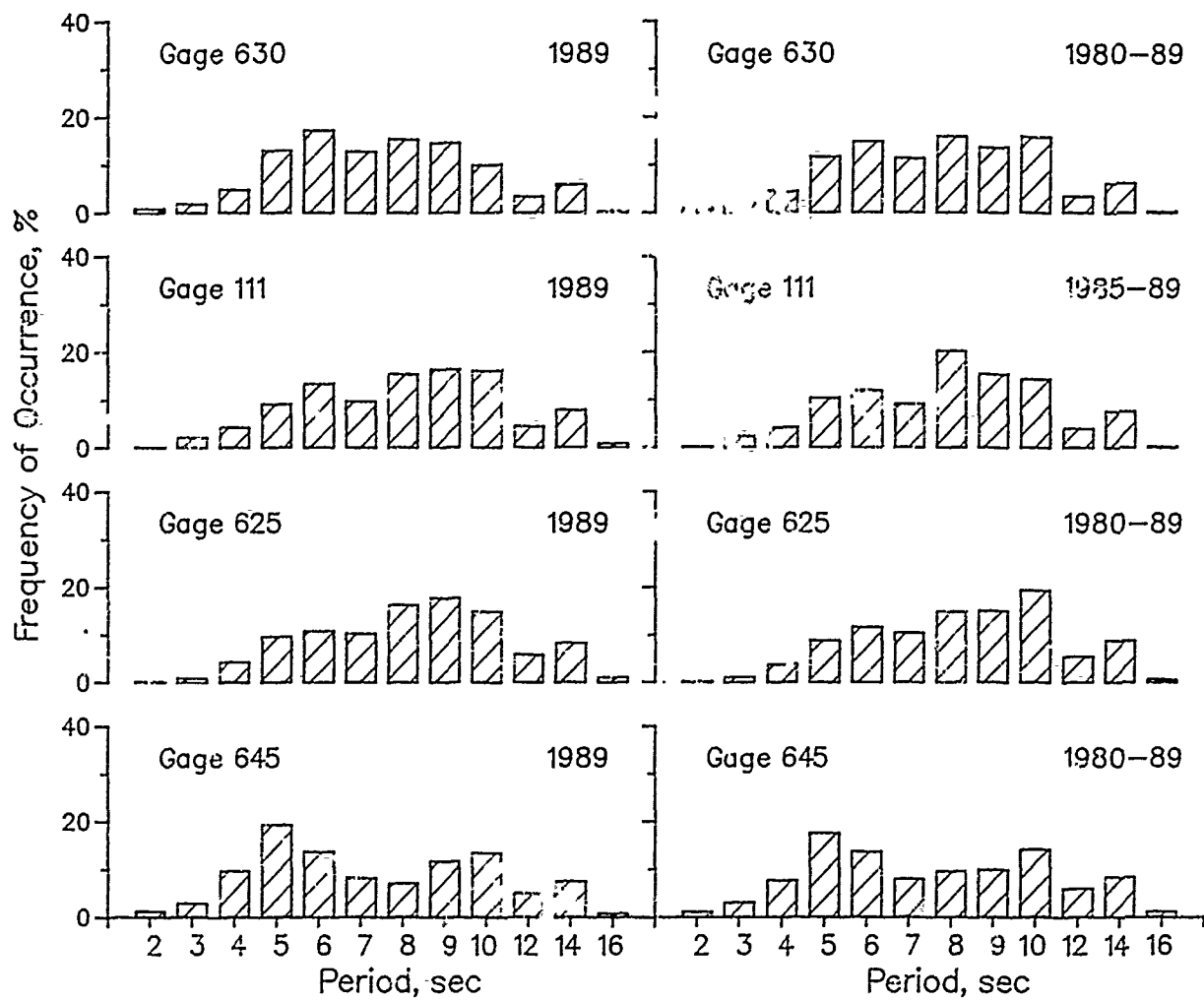


Figure C5. Annual wave period distributions for all gages

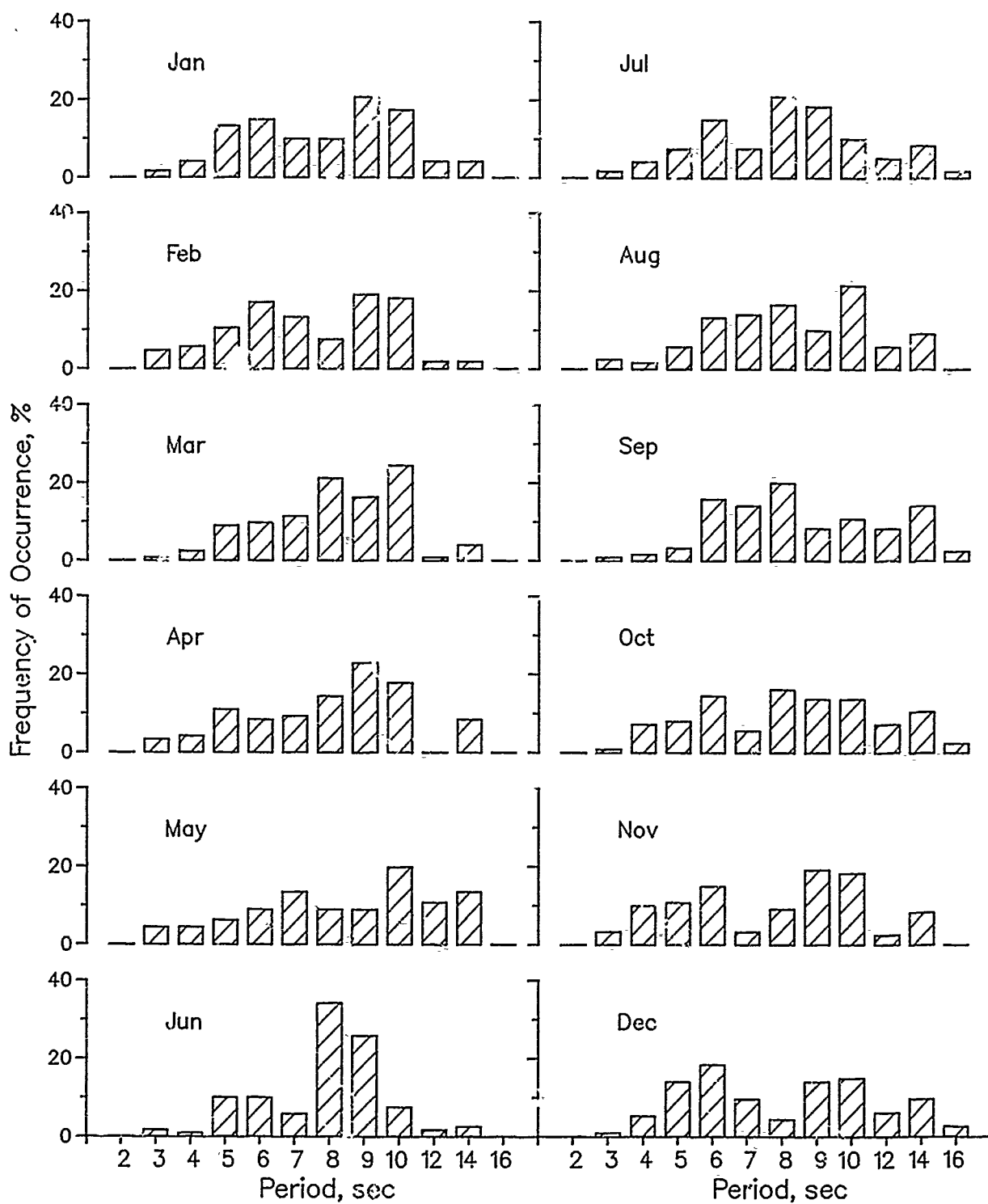


Figure C6. 1989 monthly wave period distributions for Gage 111

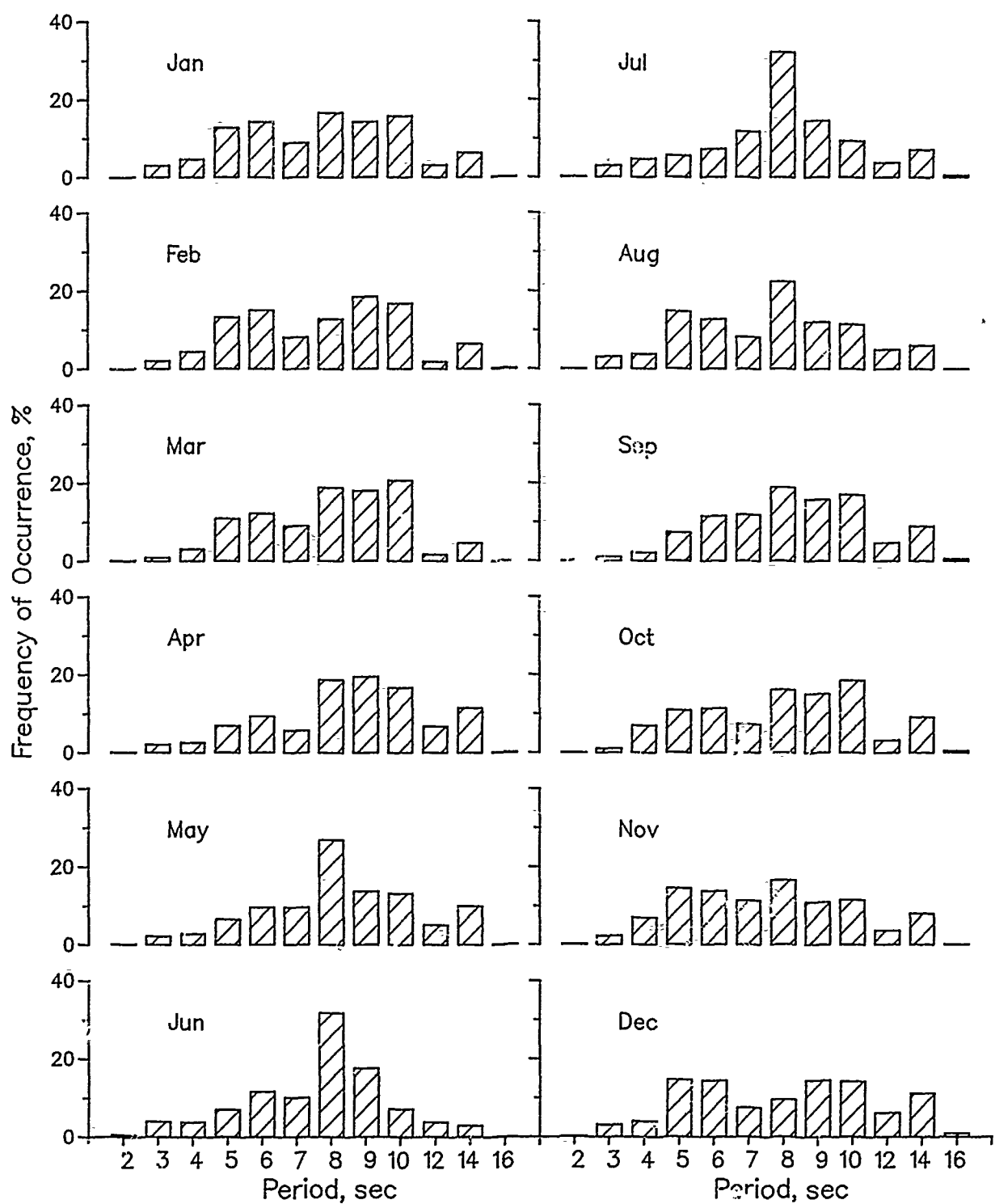


Figure C7. 1985-1989 monthly wave period distributions for Gage 111

Table C5
1989 Persistence of H_{mo} for Gage 111

Height (m)	Consecutive Day(s) or Longer																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19+
0.5	30	27	25	23	22	19	16	14	12	11	10					8		7	5
1.0	48	28	19	14	13	8	6		5		4	2	1						
1.5	35	22	11	7	6		3	2	1										
2.0	19	11	6	3	2	1													
2.5	12	7		4	1														
3.0	5		4	1															
3.5	3	2	1																
4.0																			

Table C6
1985 Through 1989 Persistence of H_{mo} for Gage 111

Height (m)	Consecutive Day(s) or Longer																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19+
0.5	29	26	23	21	18	17	15	14	13	12	10	9	8		7	6			5
1.0	49	34	22	14	11	8	6	4	3	2		1							
1.5	35	19	8	4	2			1											
2.0	16	8	3		1														
2.5	8	4	2		1														
3.0	5	3	1																
3.5	3	2	1																
4.0	2																		

* Data from gage 640 from 1985 and 1986 as well as data from gage 141 for 1987 was used for comparison with gage 111.

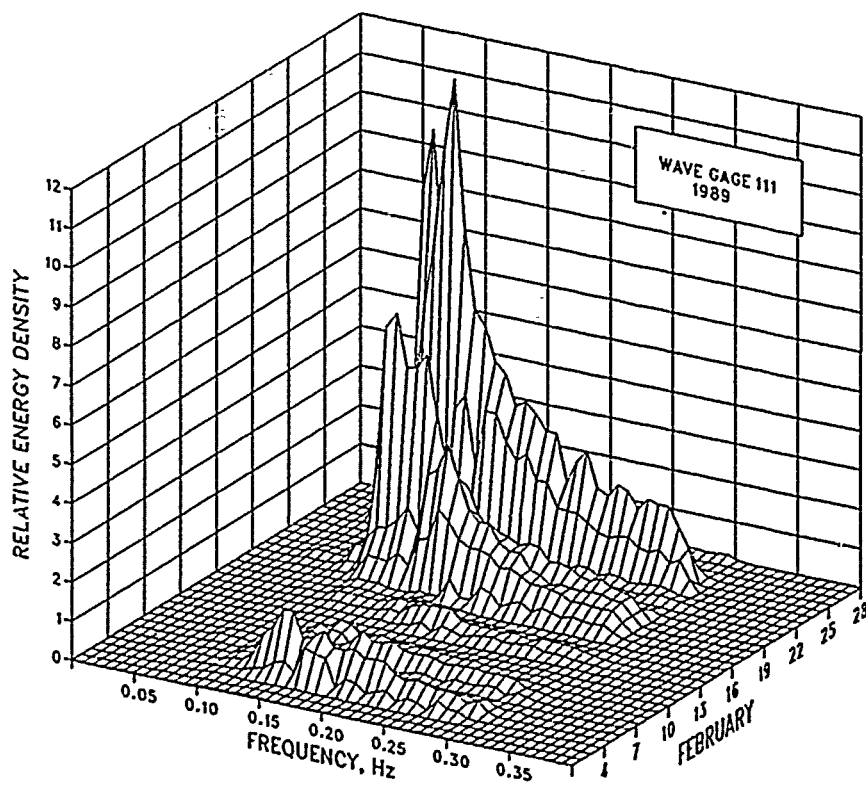
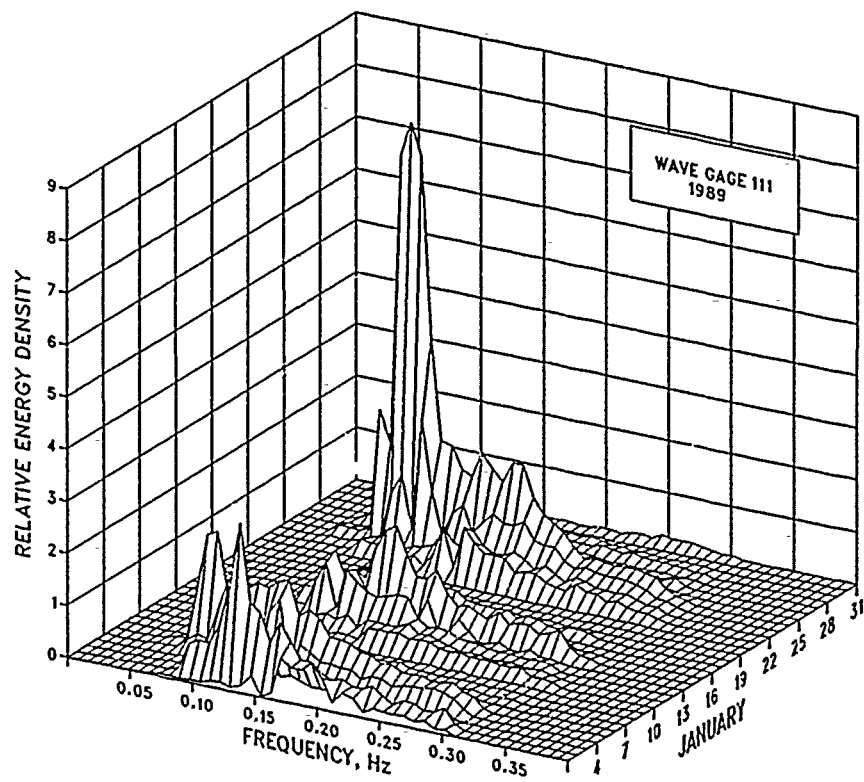


Figure C8. 1989 monthly spectra for Gage 111
(Sheet 1 of 6)

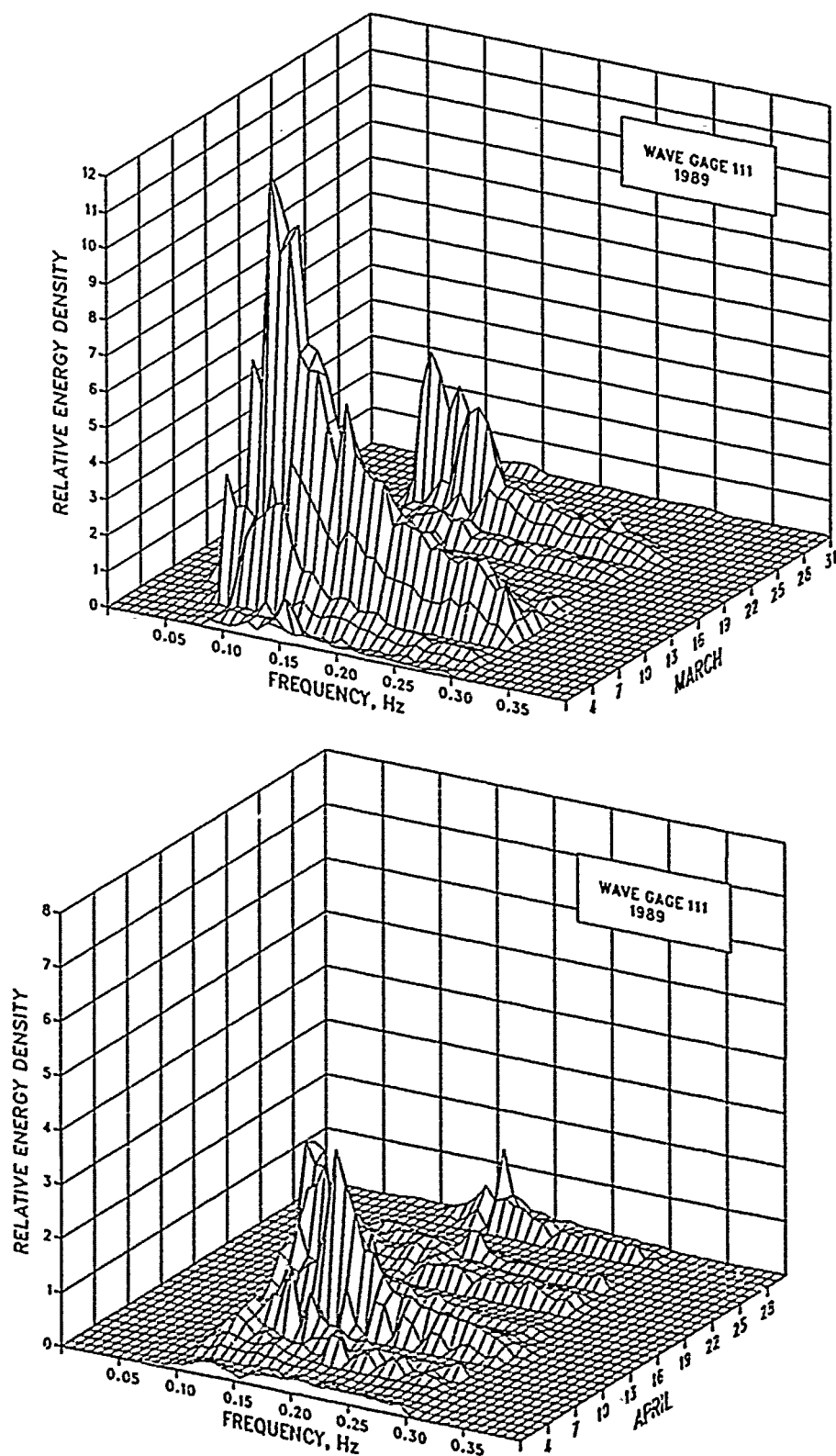


Figure C8. (Sheet 2 of 6)

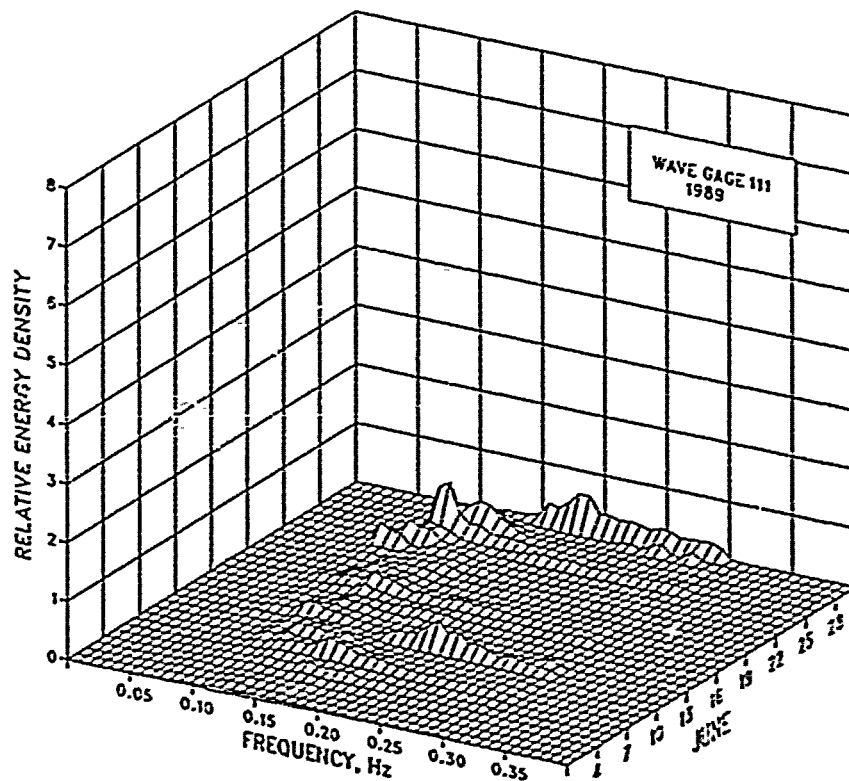
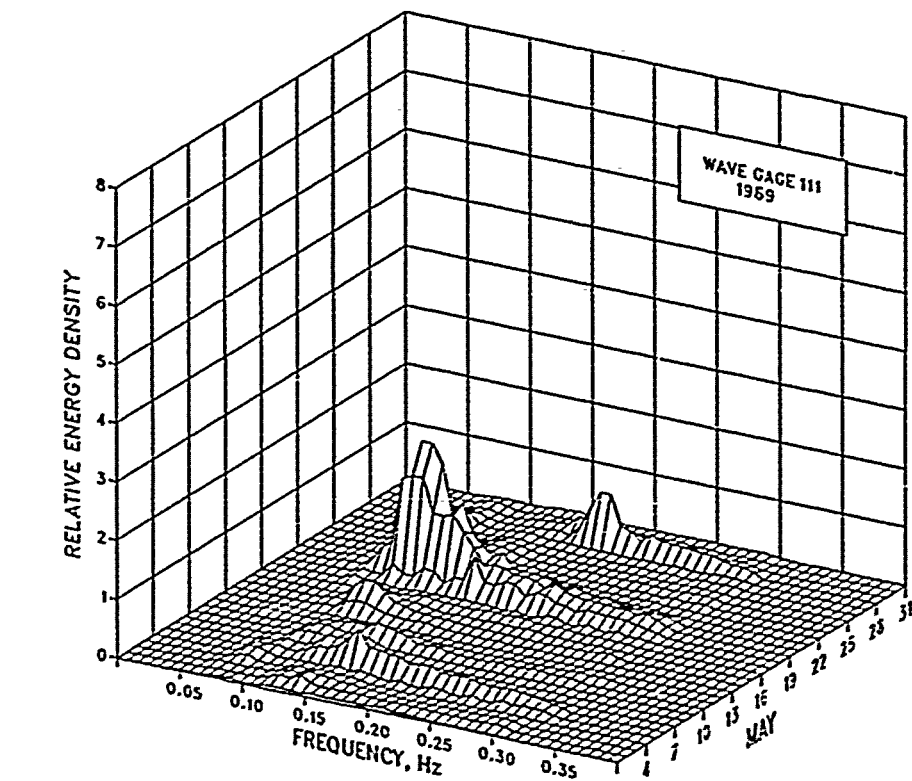


Figure C8. (Sheet 3 of 6)

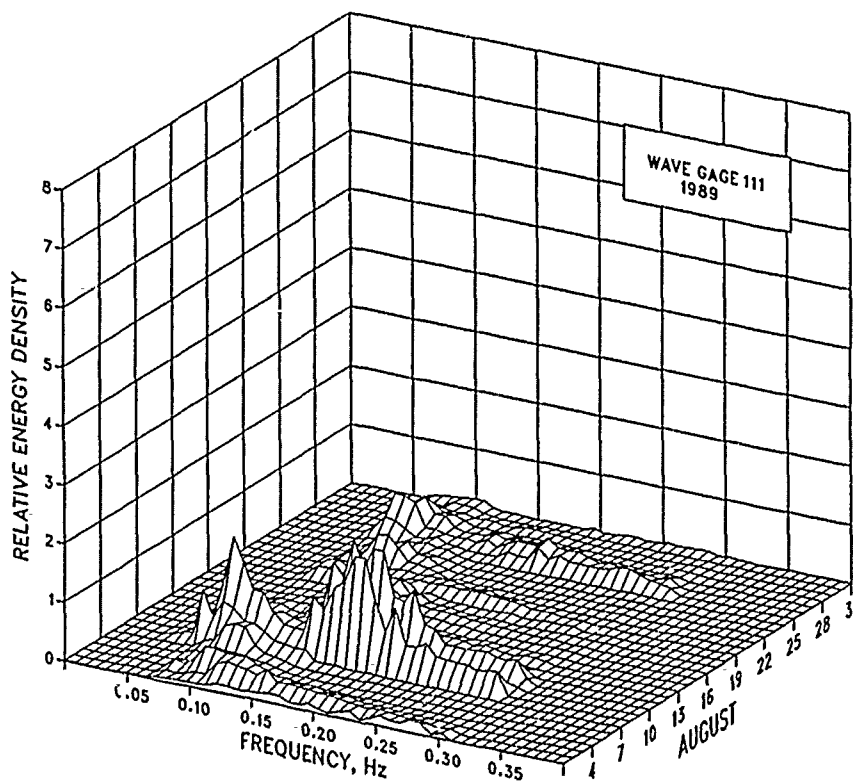
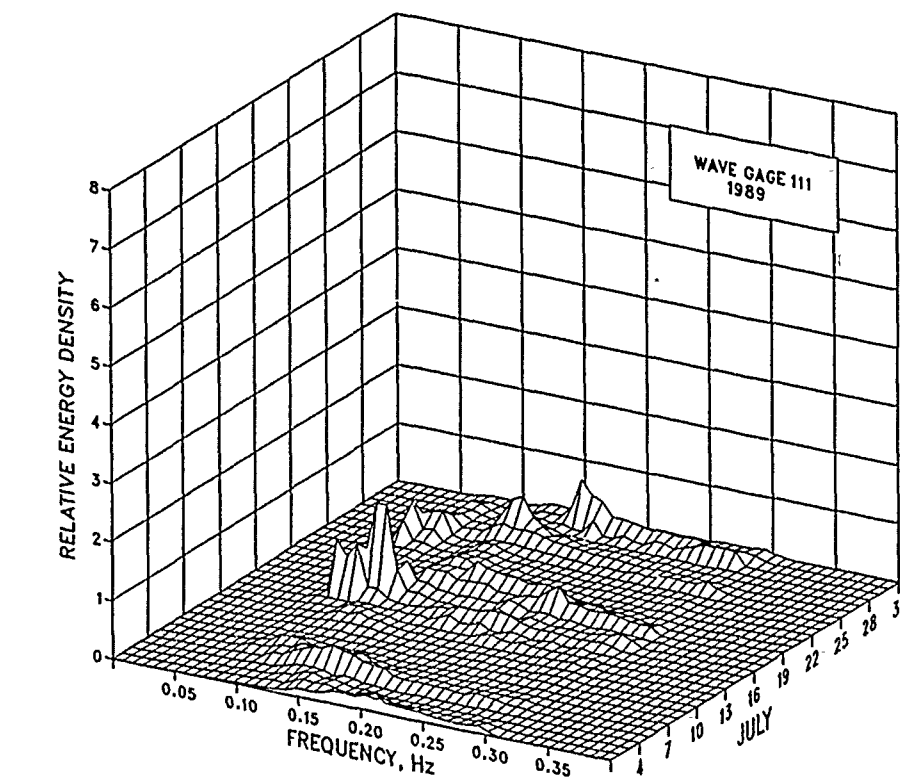


Figure C8. (Sheet 4 of 6)

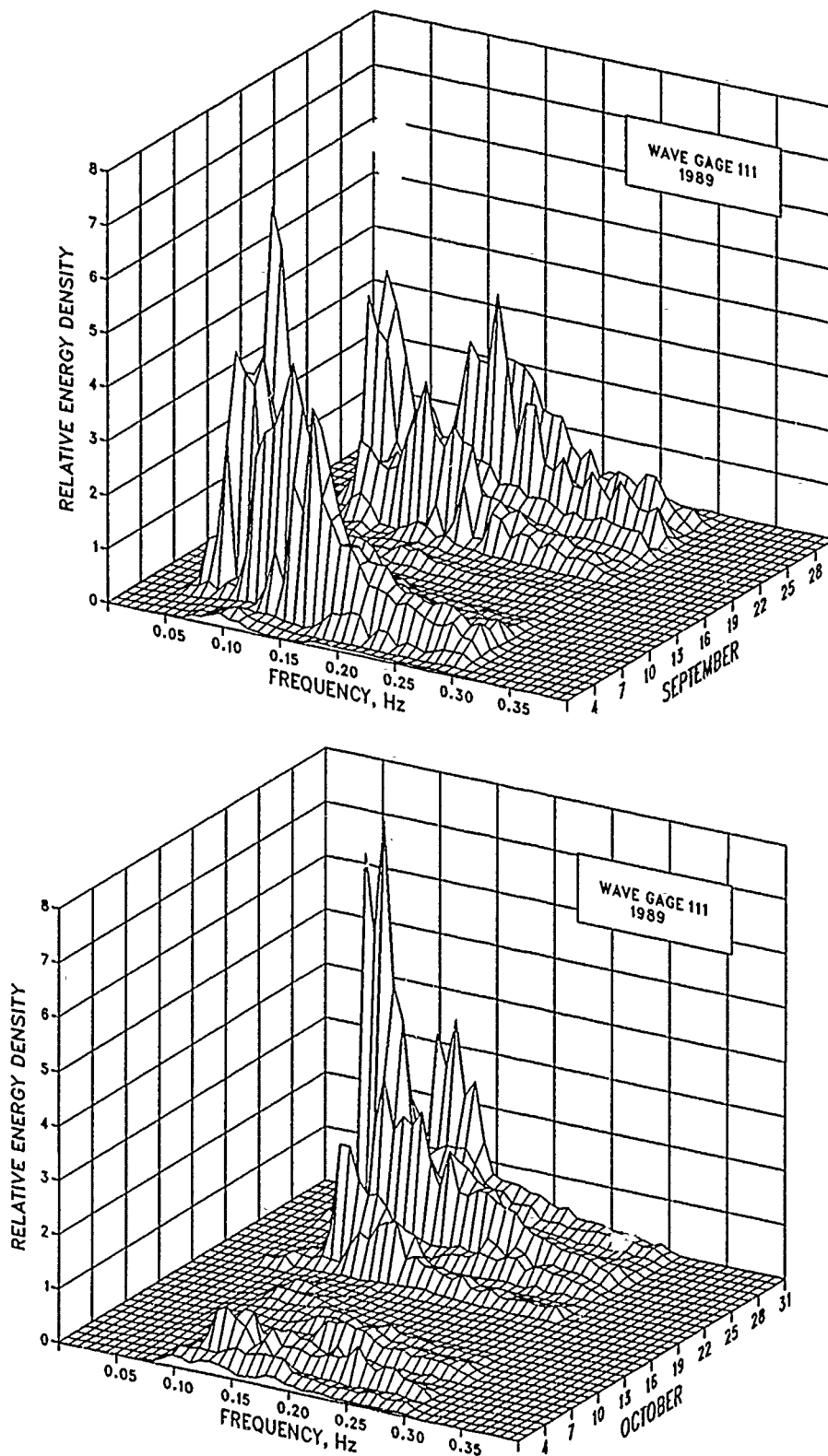


Figure C8. (Sheet 5 of 6)

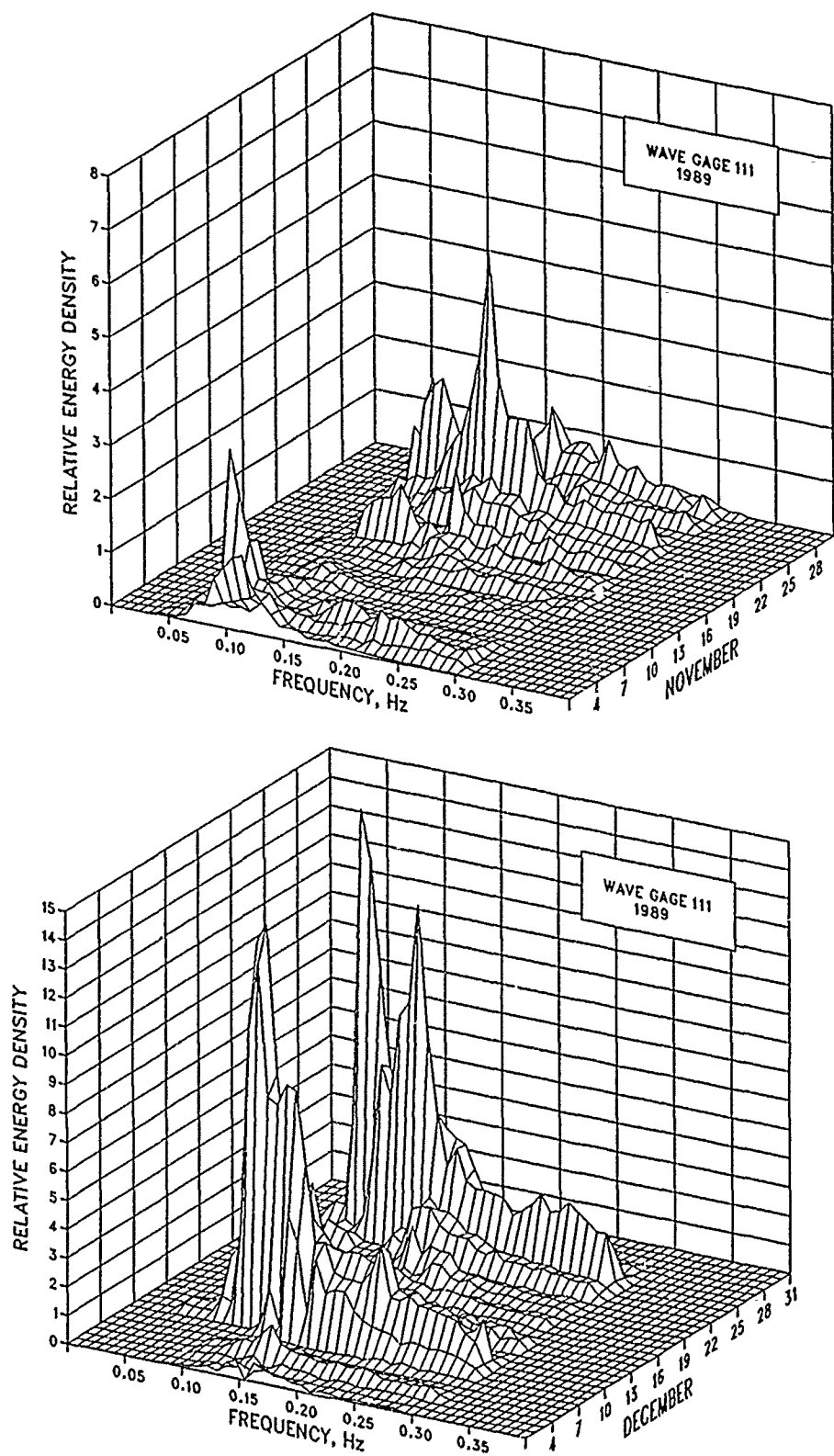


Figure C8. (Sheet 6 of 6)

Table C7
Wave Statistics for Gage 111

Month	1989							1980-1989						
	Height			Date	Period			Height			Date	Period		
	Std.				Std.			Std.				Std.		
	Mean	Dev.	Extreme		Mean	Dev.	Number	Mean	Dev.	Extreme		Mean	Dev.	Number
	m	m	m		sec	sec	Obs.	m	m	m		sec	sec	Obs.
Jan	1.1	0.6	2.9	23	8.5	2.6	121	1.0	0.6	3.8	1987	8.5	2.7	596
Feb	1.2	0.9	4.0	24	8.0	2.4	105	1.1	0.7	4.0	1989	8.5	2.6	535
Mar	1.4	1.0	4.1	8	8.8	2.1	123	1.2	0.8	4.5	1987	8.7	2.3	606
Apr	0.9	0.5	2.1	11	8.5	2.4	118	1.0	0.7	4.8	1988	9.4	2.8	577
May	0.7	0.4	1.6	20	9.5	3.4	111	0.9	0.6	3.3	1986	9.1	2.8	562
Jun	0.5	0.2	1.0	29	8.5	1.9	120	0.7	0.4	2.3	1986	8.3	2.3	586
Jul	0.6	0.2	1.1	18	9.0	3.0	120	0.6	0.3	1.9	1986	8.7	2.6	576
Aug	0.8	0.4	2.0	8	9.1	2.7	121	0.8	0.4	2.8	1985	8.4	2.7	554
Sep	1.4	0.7	2.8	24	9.7	3.2	120	1.0	0.6	2.8	1989	9.1	2.8	545
Oct	1.0	0.6	2.7	25	9.1	3.1	124	1.1	0.6	3.5	1987	8.8	2.8	590
Nov	0.9	0.5	2.5	23	8.4	2.9	120	1.0	0.6	4.1	1985	8.3	2.8	572
Dec	1.4	1.2	4.5	24	9.0	3.3	114	1.0	0.8	4.5	1989	8.9	3.3	521
Annual	1.0	0.7	4.5	Dec	8.8	2.8	1417	0.9	0.6	4.8	Apr 1982	8.7	2.7	6820

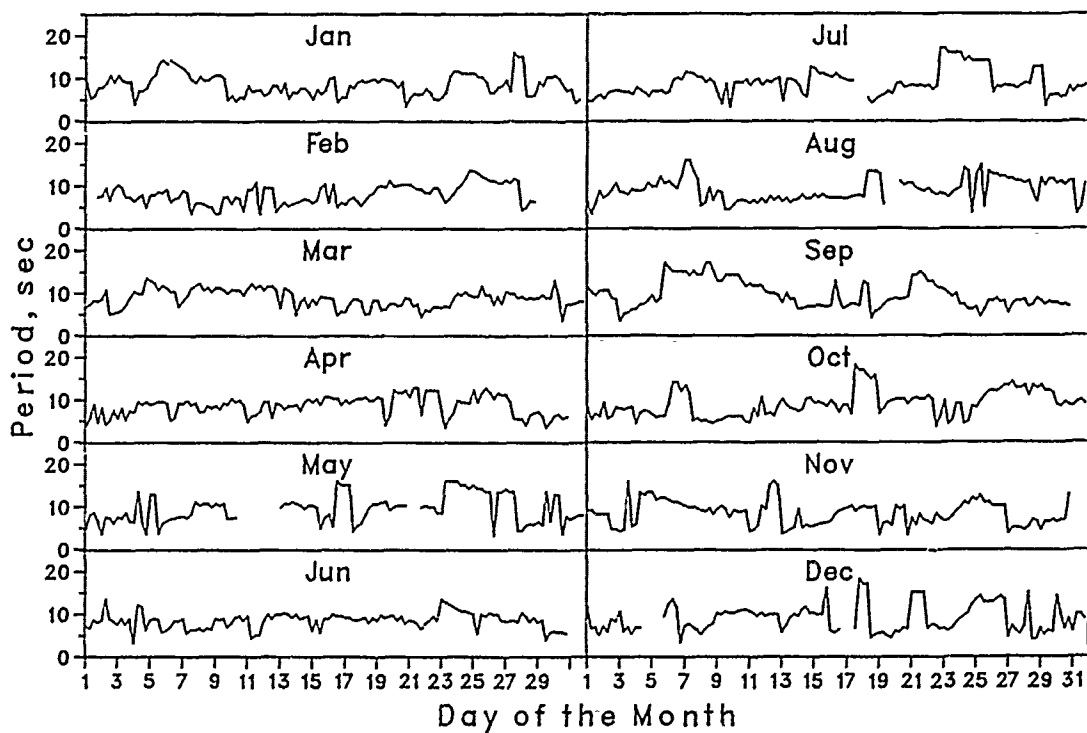
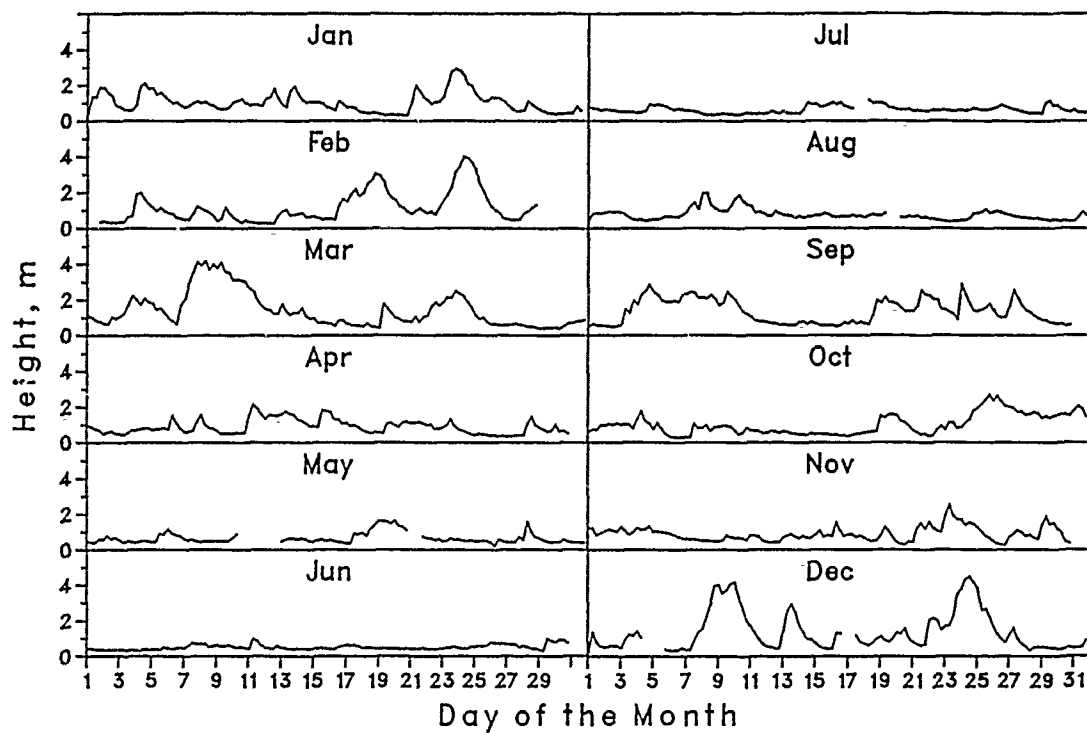


Figure C9. Time-histories of wave height and period for Garç 111

APPENDIX D: WAVE DATA FOR GAGE 625

1. Wave data summaries for Gage 625 are presented for 1989 and for 1980 through 1989 in the following forms:

Daily H_{mo} and T_p

2. Figure D1 displays the individual wave height and peak spectral wave period values along with the monthly mean values.

Joint Distributions of H_{mo} and T_p

3. Annual and monthly joint distributions tables are presented in Tables D1 and D2, and data for 1980 through 1989 are in Tables D3 and D4. Each table gives the frequency (in parts per 10,000) for which the wave height and peak period were within the specified intervals; these values can be converted to percentages by dividing by 100. Marginal totals are also included. The row total gives the total number of observations out of 10,000 that fell within each specified peak period interval. The column total gives the number of observations out of 10,000 that fell within each specified wave height interval.

Cumulative Distributions of Wave Height

4. Annual and monthly wave height distributions for 1989 are plotted in cumulative form in Figures D2 and D3. Data for 1980 through 1989 are in Figure D4.

Peak Spectral Wave Period Distributions

5. Annual and monthly peak wave period, T_p , distribution histograms for 1989 are presented in Figures D5 and D6. Data for 1980 through 1989 are in Figure D7.

Persistence of Wave Heights

6. Table D5 shows the number of times in 1989 when the specified wave height was equaled or exceeded at least once during each day for the duration (consecutive days). Data for 1980 through 1989 are given in Table D6. An example is shown below:

Height m	Consecutive Day(s) or Longer																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19+
0.5	18	15		14	13	12		11	10	9				8		7			
1.0	50	34	24	21	18	14	12	8	7	3			2						
1.5	41	19	8	6	2	1													
2.0	22	9	5	1															
2.5	10	5	2																
3.0	6	1																	
3.5		1																	
4.0	1																		

This example indicates that wave heights equaled or exceeded 1.0 m 50 times for at least 1 day; 34 times for at least 2 days; 24 times for at least 3 days, etc. Therefore, on 16 occasions the height equaled or exceeded 1.0 m for 1 day exactly ($50 - 34 = 16$); on 10 occasions for 2 days; on 3 occasions for 3 days, etc. Note that the height exceeded 1 m 50 times for 1 day or longer, while heights exceeded 0.5 m only 18 times for this same duration. This change in durations occurred because the longer durations of lower waves may be interspersed with shorter, but more frequent, intervals of higher waves. For example, one of the times that the wave heights exceeded 0.5 m for 16 days may have represented 3 times the height exceeded 1 m for shorter durations.

Spectra

7. Monthly spectra for the offshore Waverider buoy (Gage 625) are presented in Figure D8. The plots show "relative" energy density as a function of wave frequency. These figures summarize the large number of spectra for each month. The figures emphasize the higher energy density associated with storms as well as the general shifts in energy density to different frequencies. As used here, "relative" indicates the spectra have been smoothed by the three-dimension surface drawing routine. Consequently, extremely high- and low-energy density values are modified to produce a smooth

surface. The figures are not intended for quantitative measurements; however, they do provide the energy density as a function of frequency relative to the other spectra for the month.

8. Monthly and annual wave statistics for Gage 625 for 1989 and for 1980 through 1989 are presented in Table D7.

9. Figure D9 plots monthly time-histories of wave height and period.

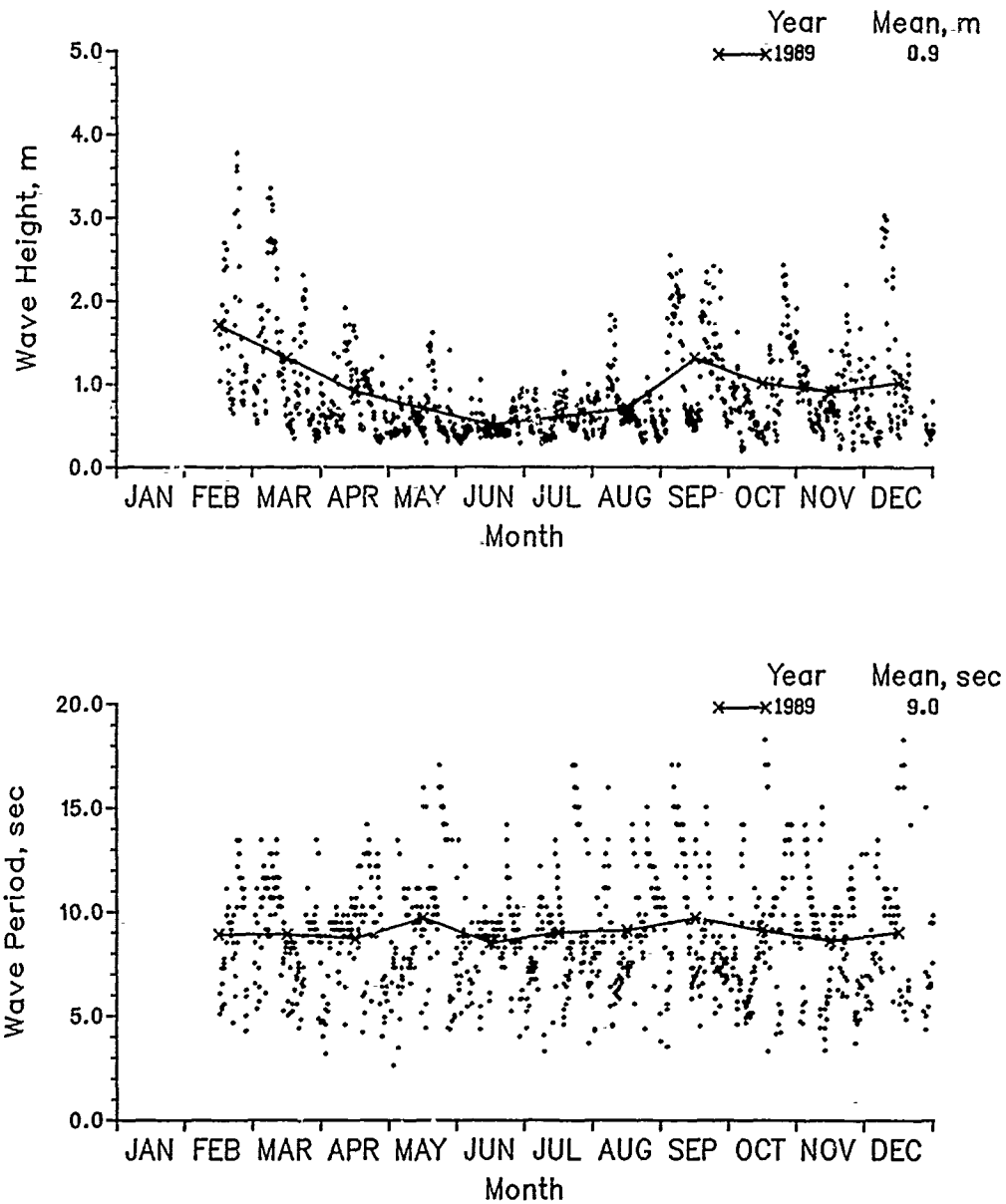


Figure D1. 1989 daily wave height and period values with monthly means for Gage 625

Table D1

Annual Joint Distribution of H_{mo} versus T_p

Annual 1983, Gage 625 Percent Occurrence(X100) of Height and Period													
Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- longer	
0.00 - 0.49	.	8	33	139	163	270	678	727	376	221	286	49	2950
0.50 - 0.99	8	74	278	556	547	515	613	670	605	98	294	33	4291
1.00 - 1.49	.	.	123	204	204	106	172	188	270	90	90	.	1447
1.50 - 1.99	.	.	.	65	139	41	98	98	90	82	65	8	686
2.00 - 2.49	25	74	41	41	33	82	57	8	361
2.50 - 2.99	16	16	33	74	.	25	.	164
3.00 - 3.49	16	16	33	8	8	.	81
3.50 - 3.99	8	8	8	.	24
4.00 - 4.49	0
4.50 - 4.99	0
5.00 - Greater	0
Total	8	82	434	964	1078	1022	1634	1773	1469	589	833	98	

Table D2
Monthly Joint Distribution of H_{mo} versus T_p

January 1989, Gage 625 Percent Occurrence(X100) of Height and Period													
Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	0
0.50 - 0.99	0
1.00 - 1.49	0
1.50 - 1.99	0
2.00 - 2.49	Gage Inoperative								0
2.50 - 2.99	0
3.00 - 3.49	0
3.50 - 3.99	0
4.00 - 4.49	0
4.50 - 4.99	0
5.00 - Greater	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0

February 1989, Gage 625 Percent Occurrence(X100) of Height and Period													
Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	0
0.50 - 0.99	208	417	833	1042	.	.	.	2500
1.00 - 1.49	.	.	417	833	208	208	.	.	1042	.	.	.	2500
1.50 - 1.99	.	.	.	625	417	208	.	208	625	.	.	.	2083
2.00 - 2.49	208	417	208	.	.	.	208	.	1041
2.50 - 2.99	208	.	208	.	.	208	.	624
3.00 - 3.49	417	.	.	208	.	.	625
3.50 - 3.99	208	208	208	.	624
4.00 - 4.49	0
4.50 - 4.99	0
5.00 - Greater	0
Total	0	0	417	1458	833	1041	1042	1249	2917	416	624	0	0

March 1989, Gage 625 Percent Occurrence(X100) of Height and Period													
Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	.	.	.	81	.	.	569	407	81	81	.	.	1300
0.50 - 0.99	.	.	244	569	244	488	894	894	407	.	.	.	3740
1.00 - 1.49	.	.	81	163	244	163	244	81	813	.	.	.	1789
1.50 - 1.99	488	81	244	81	325	81	81	.	1381
2.00 - 2.49	81	81	81	163	.	81	81	.	558
2.50 - 2.99	81	163	407	.	163	.	814
3.00 - 3.49	81	244	.	81	.	406
3.50 - 3.99	0
4.00 - 4.49	0
4.50 - 4.99	0
5.00 - Greater	0
Total	0	0	325	813	1057	813	2113	1870	2277	243	487	0	0

(Continued)

(Sheet 1 of 4)

Table D2 (Continued)

April 1989, Gage 625
Percent Occurrence(X100) of Height and Period

Height, m	Period, sec												Total
	2.0-	3.0-	4.0-	5.0-	6.0-	7.0-	8.0-	9.0-	10.0-	12.0-	14.0-	16.0-	
	2.9	3.9	4.9	5.9	6.9	7.9	8.9	9.9	11.9	13.9	15.9	Longer	
0.00 - 0.49	.	.	.	508	.	.	339	932	339	.	339	.	2457
0.50 - 0.99	.	85	508	169	678	85	593	1186	678	85	424	.	4491
1.00 - 1.49	.	.	254	254	254	.	85	932	254	85	254	.	2372
1.50 - 1.99	169	85	169	85	169	.	.	.	677
2.00 - 2.49	0
2.50 - 2.99	0
3.00 - 3.49	0
3.50 - 3.99	0
4.00 - 4.49	0
4.50 - 4.99	0
5.00 - Greater	0
Total	0	85	762	931	1101	170	1186	3135	1440	170	1017	0	

May 1989, Gage 625
Percent Occurrence(X100) of Height and Period

Height, m	Period, sec												Total
	2.0-	3.0-	4.0-	5.0-	6.0-	7.0-	8.0-	9.0-	10.0-	12.0-	14.0-	16.0-	
	2.9	3.9	4.9	5.9	6.9	7.9	8.9	9.9	11.9	13.9	15.9	Longer	
0.00 - 0.49	.	.	161	242	161	645	484	565	484	968	1048	81	4839
0.50 - 0.99	81	81	323	403	565	645	403	726	726	.	161	.	4114
1.00 - 1.49	.	.	.	81	.	161	.	161	484	.	81	.	968
1.50 - 1.99	81	.	.	.	.	81
2.00 - 2.49	0
2.50 - 2.99	0
3.00 - 3.49	0
3.50 - 3.99	0
4.00 - 4.49	0
4.50 - 4.99	0
5.00 - Greater	0
Total	81	81	484	726	726	1451	887	1533	1694	968	1290	81	

June 1989, Gage 625
Percent Occurrence(X100) of Height and Period

Height, m	Period, sec												Total
	2.0-	3.0-	4.0-	5.0-	5.0-	7.0-	8.0-	9.0-	10.0-	12.0-	14.0-	16.0-	
	2.9	3.9	4.9	5.9	6.9	7.9	8.9	9.9	11.9	13.9	15.9	Longer	
0.00 - 0.49	.	.	.	265	531	619	2655	1770	531	265	177	.	6813
0.50 - 0.99	.	.	177	708	265	88	885	796	177	.	.	.	3096
1.00 - 1.49	.	.	88	.	.	.	.	.	.	.	.	.	88
1.50 - 1.99	0
2.00 - 2.49	0
2.50 - 2.99	0
3.00 - 3.49	0
3.50 - 3.99	0
4.00 - 4.49	0
4.50 - 4.99	0
5.00 - Greater	0
Total	0	0	265	973	796	707	3540	2566	708	265	177	0	

(Continued)

(Sheet 2 of 4)

Table D2 (Continued)

July 1989, Gage 625
Percent Occurrence(X100) of Height and Period

Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	.	81	81	.	81	569	1301	813	407	163	244	163	3903
0.50 - 0.99	.	81	244	732	976	976	732	569	488	488	569	81	5936
1.00 - 1.49	.	.	81	.	81	.	.	.	.	.	.	.	162
1.50 - 1.99	0
2.00 - 2.49	0
2.50 - 2.99	0
3.00 - 3.49	0
3.50 - 3.99	0
4.00 - 4.49	0
4.50 - 4.99	0
5.00 - Greater	0
Total	0	162	406	732	1138	1545	2033	1382	895	651	813	244	0

August 1989, Gage 625
Percent Occurrence(X100) of Height and Period

Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	83	83	826	661	826	.	83	.	2562
0.50 - 0.99	.	83	331	331	661	1405	909	331	909	331	1074	.	6365
1.00 - 1.49	.	.	83	.	331	.	.	83	.	165	83	.	745
1.50 - 1.99	.	.	.	165	165	.	.	.	.	.	.	.	330
2.00 - 2.49	0
2.50 - 2.99	0
3.00 - 3.49	0
3.50 - 3.99	0
4.00 - 4.49	0
4.50 - 4.99	0
5.00 - Greater	0
Total	0	83	414	496	1240	1488	1735	1075	1735	496	1240	0	0

September 1989, Gage 625
Percent Occurrence(X100) of Height and Period

Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	250	167	.	167	83	83	.	.	750
0.50 - 0.99	.	83	.	83	750	667	667	333	583	.	417	.	3593
1.00 - 1.49	.	.	83	417	.	417	333	167	250	167	167	.	2001
1.50 - 1.99	.	.	.	83	250	167	250	250	83	167	583	83	1916
2.00 - 2.49	417	250	.	.	583	333	83	1666
2.50 - 2.99	83	.	.	.	.	83
3.00 - 3.49	0
3.50 - 3.99	0
4.00 - 4.49	0
4.50 - 4.99	0
5.00 - Greater	0
Total	0	83	83	583	1250	1835	1500	1000	999	1000	1500	166	0

(Continued)

(Sheet 3 of 4)

Table D2 (Concluded)

October 1989, Gage 625
Percent Occurrence(X100) of Height and Period

Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	.	.	.	81	81	242	565	645	403	242	242	242	2743
0.50 - 0.99	.	81	403	968	645	484	242	403	484	.	81	.	3791
1.00 - 1.49	.	.	161	242	81	161	323	323	81	161	161	.	1694
1.50 - 1.99	.	.	.	81	81	.	242	242	.	565	.	.	1211
2.00 - 2.49	81	242	161	81	.	565
2.50 - 2.99	0
3.00 - 3.49	0
3.50 - 3.99	0
4.00 - 4.49	0
4.50 - 4.99	0
5.00 - Greater	0
Total	0	81	564	1372	888	887	1372	1694	1210	1129	565	242	

November 1989, Gage 625
Percent Occurrence(X100) of Height and Period

Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	83	167	167	917	500	250	167	.	2251
0.50 - 0.99	.	250	417	917	667	83	500	917	833	167	167	.	4751
1.00 - 1.49	.	.	250	250	500	83	583	167	250	333	167	.	2583
1.50 - 1.99	.	.	.	83	83	.	83	83	.	.	.	.	332
2.00 - 2.49	83	.	.	.	.	.	.	.	83
2.50 - 2.99	0
3.00 - 3.49	0
3.50 - 3.99	0
4.00 - 4.49	0
4.50 - 4.99	0
5.00 - Greater	0
Total	0	250	667	1250	1416	333	1333	2084	1583	583	501	0	

December 1989, Gage 625
Percent Occurrence(X100) of Height and Period

Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	.	.	111	333	556	333	111	778	222	222	667	.	3333
0.50 - 0.99	.	.	222	1000	111	222	333	444	556	111	111	333	3443
1.00 - 1.49	.	.	.	444	667	111	222	.	222	.	.	.	1666
1.50 - 1.99	111	111	.	.	.	222
2.00 - 2.49	111	.	222	111	.	.	.	444
2.50 - 2.99	111	111	.	444	.	.	.	666
3.00 - 3.49	111	111	.	.	.	222
3.50 - 3.99	0
4.00 - 4.49	0
4.50 - 4.99	0
5.00 - Greater	0
Total	0	0	333	1777	1334	883	777	1665	1777	333	778	333	

(Sheet 4 of 4)

Table D3
Annual Joint Distribution of H_{mo} versus T_p (All Years)

Annual 1980-1989, Gage 625 Percent Occurrence(X100) of Height and Period													
Height, m	Period, sec												
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	Total
0.00 - 0.49	8	21	39	62	113	221	499	450	397	194	255	19	2278
0.50 - 0.99	5	81	244	440	479	435	686	725	871	180	299	32	4477
1.00 - 1.49	.	5	91	307	351	223	191	190	372	52	145	2	1929
1.50 - 1.99	.	.	3	68	179	104	63	68	146	49	81	6	767
2.00 - 2.49	.	.	.	2	37	45	24	39	79	45	51	2	324
2.50 - 2.99	.	.	.	.	4	15	22	25	45	18	35	2	166
3.00 - 3.49	.	.	.	.	.	.	5	7	18	7	12	.	49
3.50 - 3.99	.	.	.	.	.	.	.	.	3	2	3	.	8
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	13	107	377	879	1163	1043	1490	1504	1931	547	881	63	0

Table D4
Monthly Joint Distribution of H_{mo} versus T_p (All Years)

January 1980-1989, Gage 625													
Percent Occurrence(X100) of Height and Period													
Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	11	32	63	53	105	158	285	295	337	169	148	11	1667
0.50 - 0.99	.	169	253	390	443	295	485	379	885	158	295	11	3763
1.00 - 1.49	.	.	95	580	632	242	221	211	485	.	95	.	2561
1.50 - 1.99	.	.	.	105	274	253	84	126	190	42	42	.	1116
2.00 - 2.49	84	179	11	42	179	53	95	.	643
2.50 - 2.99	11	21	32	32	63	32	32	.	223
3.00 - 3.49	11	11	.	.	.	22
3.50 - 3.99	11	.	.	.	11
4.00 - 4.49	0
4.50 - 4.99	0
5.00 - Greater	11	201	411	1128	1549	1148	1118	1096	2161	454	707	22	0

February 1980-1989, Gage 625													
Percent Occurrence(X100) of Height and Period													
Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	.	10	31	21	41	51	164	144	236	92	154	.	944
0.50 - 0.99	10	62	133	390	338	349	636	677	1179	82	308	10	4174
1.00 - 1.49	.	.	123	421	441	267	215	256	687	72	215	.	2697
1.50 - 1.99	.	.	.	154	287	133	72	133	277	92	103	.	1251
2.00 - 2.49	31	62	51	72	82	72	123	.	493
2.50 - 2.99	21	21	41	82	21	113	.	299
3.00 - 3.49	31	10	41	10	10	.	102
3.50 - 3.99	10	10	21	.	41
4.00 - 4.49	0
4.50 - 4.99	0
5.00 - Greater	10	72	287	986	1138	883	1190	1333	2594	451	1047	10	0

March 1980-1989, Gage 625													
Percent Occurrence(X100) of Height and Period													
Height, m	Period, sec												Total
	2.0-	3.0-	4.0-	5.0-	6.0-	7.0-	8.0-	9.0-	10.0-	12.0-	14.0-	16.0-	
	2.9	3.9	4.9	5.9	6.9	7.9	8.9	9.9	11.9	13.9	15.9	Longer	
0.00 - 0.49	9	.	.	71	44	71	285	222	231	107	125	.	1165
0.50 - 0.99	9	44	222	516	463	498	756	658	863	116	285	.	4430
1.00 - 1.49	.	9	125	285	320	311	178	231	658	36	329	.	2482
1.50 - 1.99	.	.	.	71	196	80	98	80	240	71	160	9	1005
2.00 - 2.49	.	.	.	9	62	36	36	36	151	80	71	.	481
2.50 - 2.99	.	.	.	.	.	9	36	18	107	44	62	.	276
3.00 - 3.49	.	.	.	.	.	.	18	18	62	18	44	.	160
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	.	.	.	.	.	.	.	.	.	.	.	.	0
	18	53	347	952	1085	1005	1407	1263	2312	472	1076	9	

(Continued)

(Sheet 1 of 4)

Table D4 (Continued)

April 1980-1989, Gage 625
Percent Occurrence(X100) of Height and Period

Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	19	10	10	76	57	67	400	400	353	181	353		1926
0.50 - 0.99	.	57	200	219	324	372	696	915	1306	248	543	19	4899
1.00 - 1.49	.	.	95	172	267	248	219	315	410	48	191	.	1965
1.50 - 1.99	.	.	10	29	124	57	76	124	229	19	95	.	763
2.00 - 2.49	.	.	.	10	19	.	29	29	86	19	10	.	202
2.50 - 2.99	10	19	29	19	57	38	10	.	182
3.00 - 3.49	10	38	.	19	.	67
3.50 - 3.99	0
4.00 - 4.49	0
4.50 - 4.99	0
5.00 - Greater	19	67	315	506	801	763	1449	1812	2479	553	1221	19	0

May 1980-1989, Gage 625
Percent Occurrence(X100) of Height and Period

Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	9	26	44	61	193	280	640	526	421	193	324	9	2726
0.50 - 0.99	9	131	237	403	587	526	1096	1052	780	70	219	9	5119
1.00 - 1.49	.	.	26	140	149	210	351	210	307	18	105	.	1516
1.50 - 1.99	.	.	.	53	61	18	61	53	79	18	79	.	422
2.00 - 2.49	.	.	.	.	26	26	.	9	.	44	26	9	140
2.50 - 2.99	.	.	.	.	.	.	.	.	26	26	18	.	70
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	9	.	9
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	18	157	307	657	1016	1060	2148	1850	1613	369	780	27	0

June 1980-1989, Gage 625
Percent Occurrence(X100) of Height and Period

Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	41	73	93	114	332	519	1286	757	477	145	176	21	4034
0.50 - 0.99	10	166	280	467	322	488	1131	1100	633	114	41	21	4773
1.00 - 1.49	.	.	52	124	176	135	135	114	187	.	10	10	943
1.50 - 1.99	.	.	.	41	41	31	.	.	73	.	21	.	207
2.00 - 2.49	.	.	.	.	10	10	10	10	10	.	.	.	50
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	51	239	425	746	881	1183	2562	1981	1380	259	248	52	0

(Continued)

(Sheet 2 of 4)

Table D4 (Continued)

July 1980-1989, Gage 625
Percent Occurrence(X100) of Height and Period

Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- longer	
0.00 - 0.49	.	56	112	78	179	592	1306	1083	804	324	413	56	5003
0.50 - 0.99	.	100	324	391	636	603	759	703	379	290	167	89	4441
1.00 - 1.49	.	.	56	145	145	56	33	33	.	.	11	.	479
1.50 - 1.99	22	22	22	.	.	.	.	.	66
2.00 - 2.49	0
2.50 - 2.99	0
3.00 - 3.49	0
3.50 - 3.99	0
4.00 - 4.49	0
4.50 - 4.99	0
5.00 - Greater	0	156	492	614	982	1273	2120	1819	1183	614	591	145	0

August 1980-1989, Gage 625
Percent Occurrence(X100) of Height and Period

Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- longer	
0.00 - 0.49	.	21	21	52	197	466	818	839	652	311	207	10	3594
0.50 - 0.99	21	93	238	621	663	704	859	714	569	217	300	31	5030
1.00 - 1.49	.	.	62	228	228	135	114	52	62	21	10	.	912
1.50 - 1.99	.	.	.	52	114	41	10	10	41	10	31	.	309
2.00 - 2.49	10	10	.	.	31	.	52	.	103
2.50 - 2.99	10	10	10	.	.	.	30
3.00 - 3.49	10	10	.	.	.	20
3.50 - 3.99	0
4.00 - 4.49	0
4.50 - 4.99	0
5.00 - Greater	21	114	321	953	1212	1356	1811	1635	1375	559	600	41	0

September 1980-1989, Gage 625
Percent Occurrence(X100) of Height and Period

Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- longer	
0.00 - 0.49	.	.	11	22	77	133	155	387	442	232	221	65	1746
0.50 - 0.99	.	33	221	310	531	420	420	708	1051	177	398	.	4269
1.00 - 1.49	.	.	44	321	409	332	254	288	509	144	199	.	2500
1.50 - 1.99	.	.	.	100	232	166	100	111	100	66	111	11	997
2.00 - 2.49	77	44	22	11	100	77	11	342
2.50 - 2.99	11	11	33	44	.	33	.	132
3.00 - 3.49	11	.	.	.	11
3.50 - 3.99	0
4.00 - 4.49	0
4.50 - 4.99	0
5.00 - Greater	0	33	276	753	1249	1139	984	1549	2168	719	1039	88	0

(Continued)

(Sheet 3 of 4)

Table D4 (Concluded)

October 1980-1989, Gage 625
Percent Occurrence(X100) of Height and Period

Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- longer	
0.00 - 0.49	9	.	17	51	17	137	291	274	317	111	257	43	1524
0.50 - 0.99	.	60	197	359	402	317	470	624	1078	171	274	43	3995
1.00 - 1.49	.	9	145	419	342	188	111	257	470	86	222	17	2266
1.50 - 1.99	.	.	26	103	265	77	68	86	240	128	145	26	1164
2.00 - 2.49	86	68	60	128	163	77	51	9	642
2.50 - 2.99	17	51	60	51	26	17	68	17	307
3.00 - 3.49	9	.	.	34	34	.	77
3.50 - 3.99	17	9	.	.	26
4.00 - 4.49	0
4.50 - 4.99	0
5.00 - Greater	9	69	385	932	1129	838	1069	1420	2311	633	1051	155	0

November 1980-1989, Gage 625
Percent Occurrence(X100) of Height and Period

Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- longer	
0.00 - 0.49	.	9	47	74	47	140	251	242	242	205	326	.	1583
0.50 - 0.99	.	47	372	512	624	410	549	540	698	279	363	28	4422
1.00 - 1.49	.	37	158	400	577	298	279	158	270	140	130	9	2456
1.50 - 1.99	.	.	.	56	251	205	130	47	112	93	65	19	978
2.00 - 2.49	56	28	28	9	74	56	65	.	316
2.50 - 2.99	9	28	37	19	28	37	.	158
3.00 - 3.49	9	28	9	19	.	65
3.50 - 3.99	19	.	19
4.00 - 4.49	0
4.50 - 4.99	0
5.00 - Greater	0	93	577	1042	1555	1090	1265	1042	1443	810	1024	56	0

December 1980-1989, Gage 625
Percent Occurrence(X100) of Height and Period

Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- longer	
0.00 - 0.49	.	21	32	64	95	106	233	361	339	308	361	21	1941
0.50 - 0.99	.	21	265	721	424	255	329	594	965	265	392	138	4369
1.00 - 1.49	.	.	95	456	541	233	148	117	350	53	170	.	2163
1.50 - 1.99	.	.	.	53	265	191	21	42	138	21	85	.	816
2.00 - 2.49	42	53	11	95	138	32	42	.	413
2.50 - 2.99	11	32	32	53	106	.	32	.	266
3.00 - 3.49	21	11	.	.	.	32
3.50 - 3.99	0
4.00 - 4.49	0
4.50 - 4.99	0
5.00 - Greater	0	42	392	1294	1378	870	774	1283	2047	679	1082	159	0

(Sheet 4 of 4)

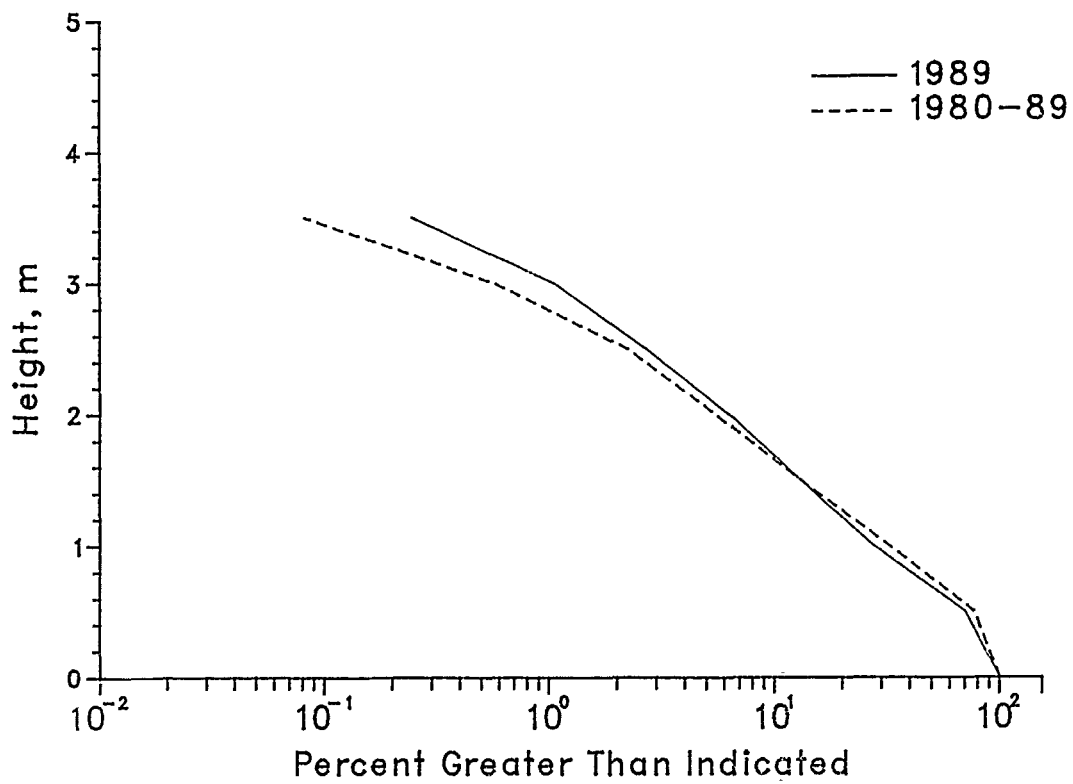


Figure D2. Annual cumulative wave height distributions
for Gage 625

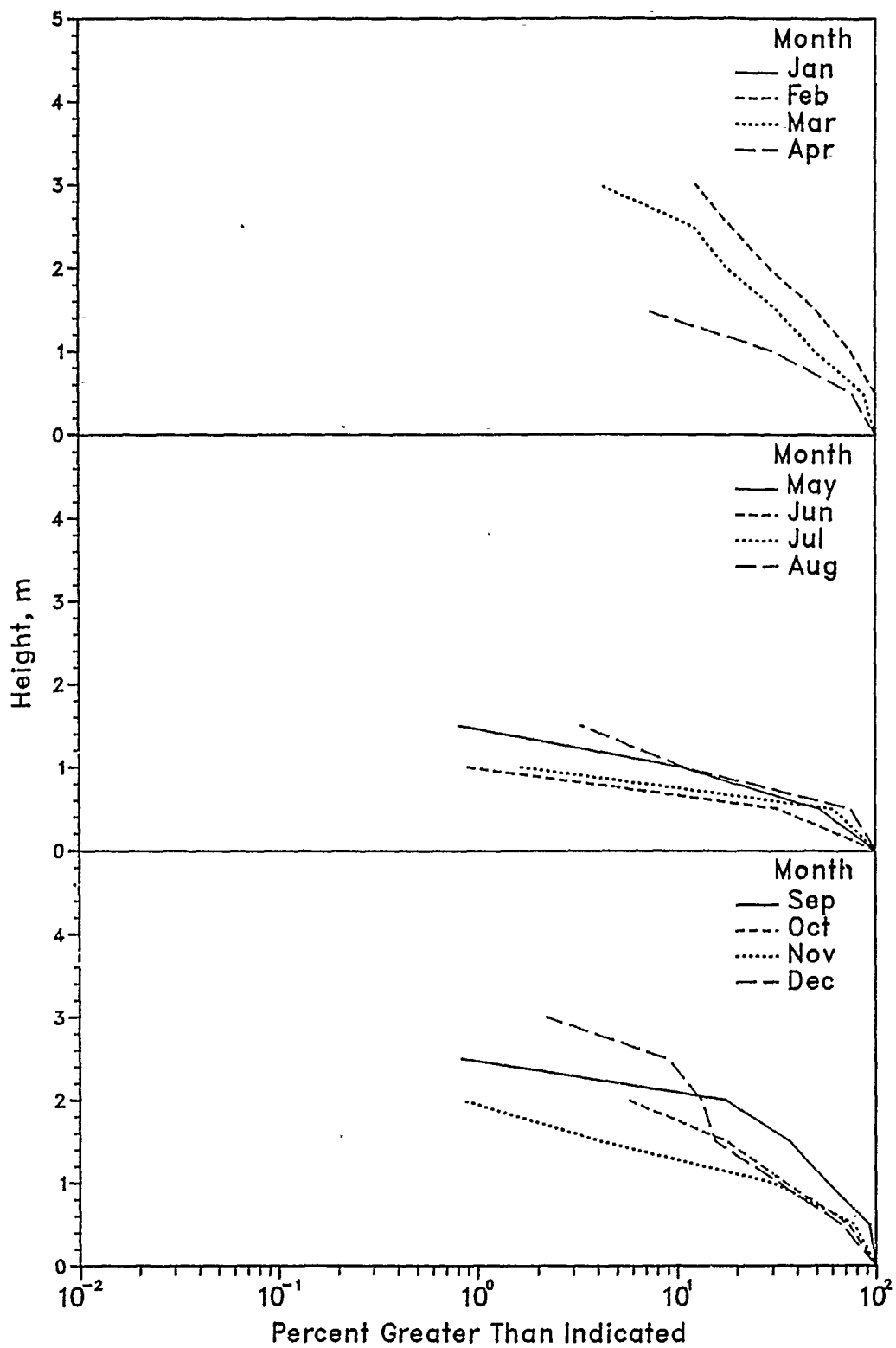


Figure D3. 1989 monthly wave height distributions
for Gage 625

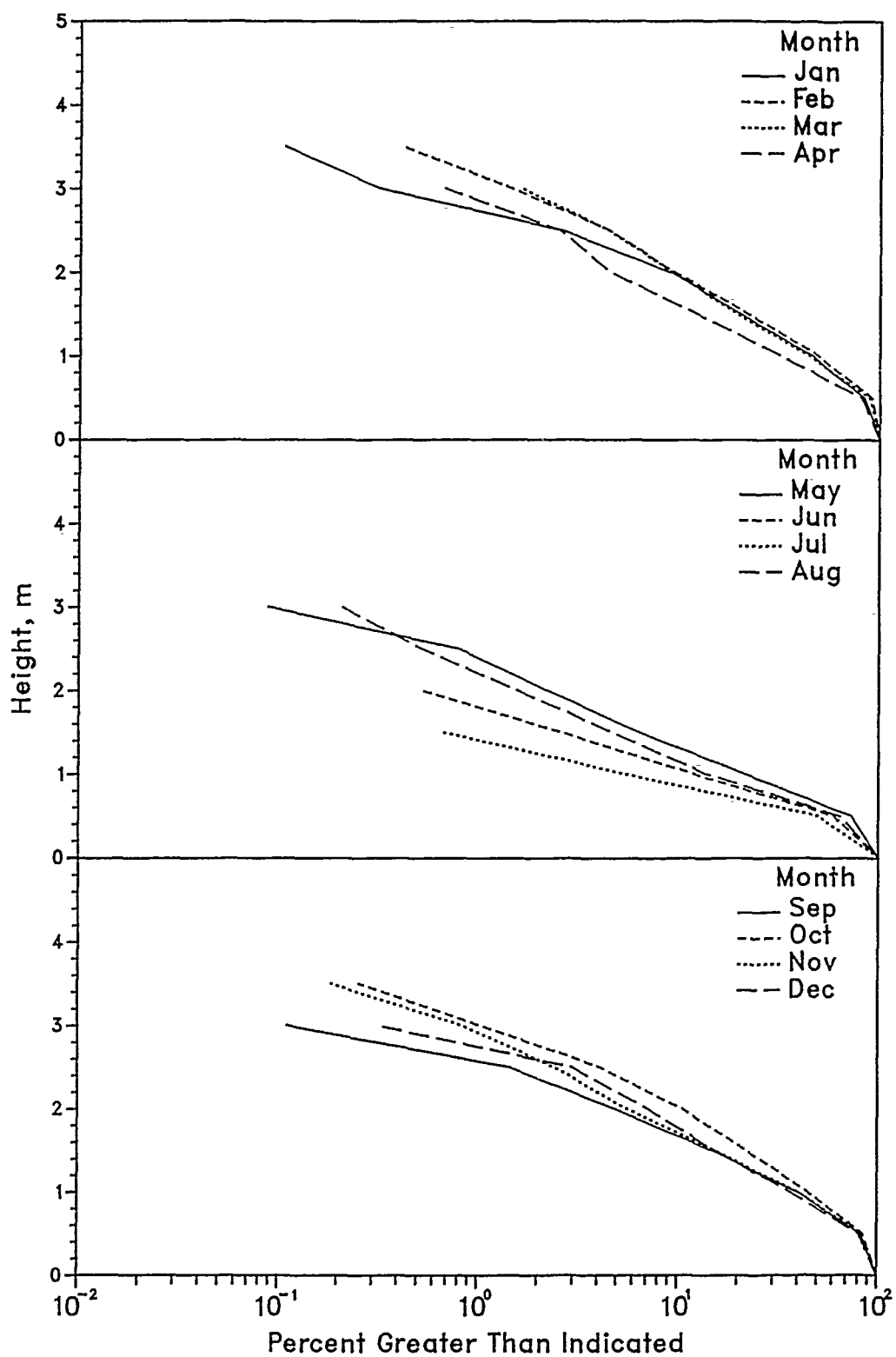


Figure D4. 1980-1989 monthly wave height distributions for Gage 625

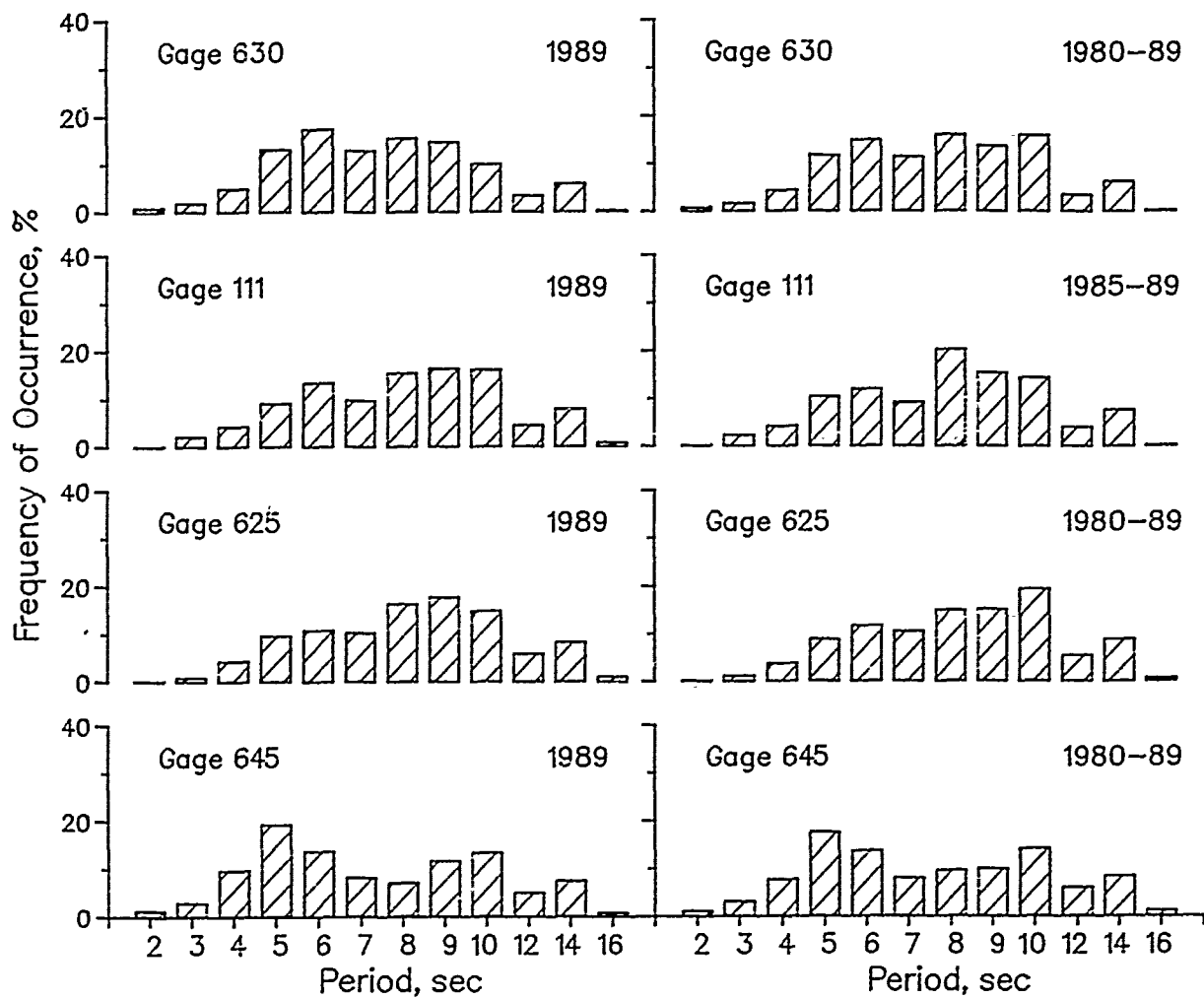


Figure D5. Annual wave period distributions for all gages

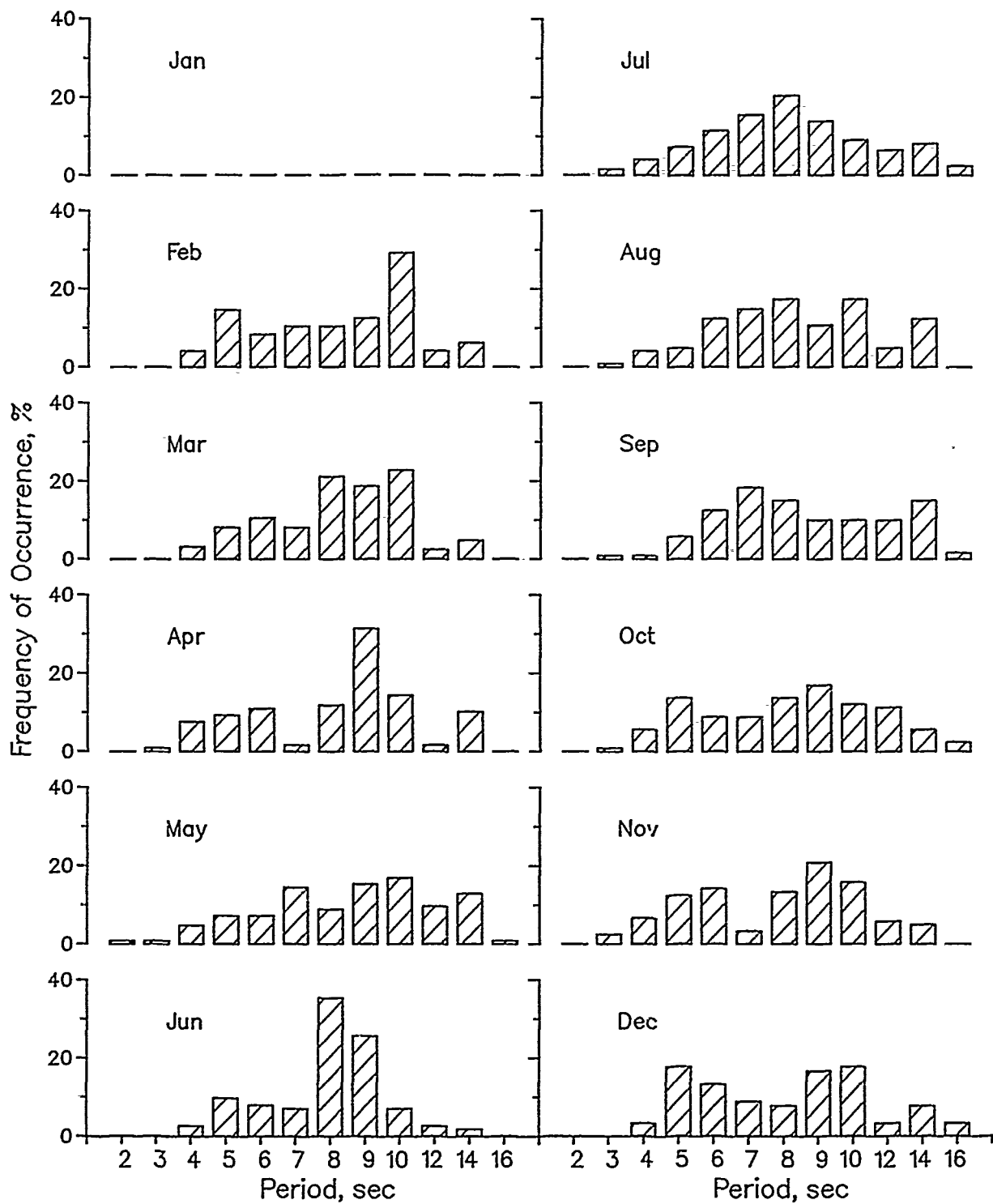


Figure D6. 1989 monthly wave period distributions for Gage 625

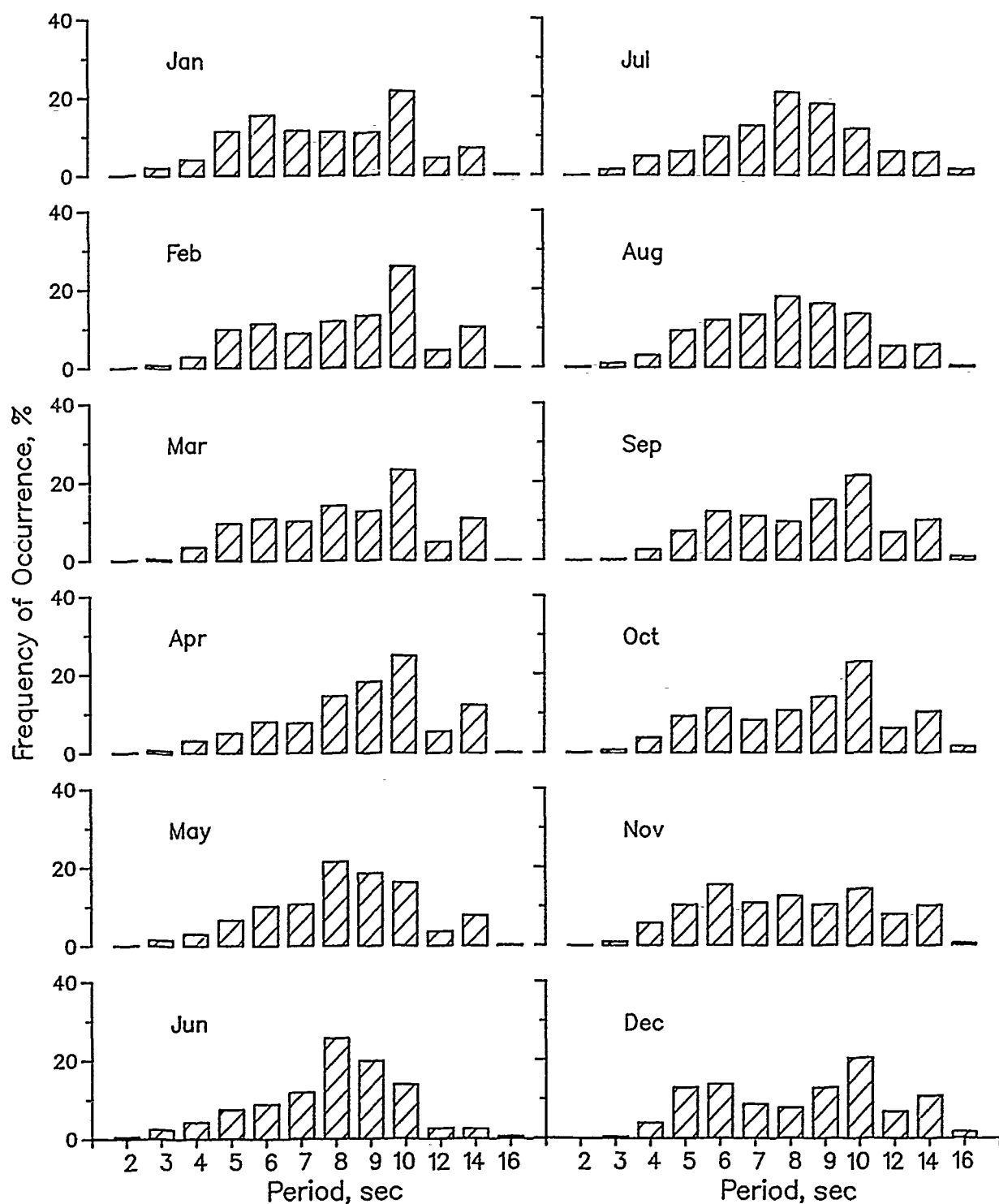


Figure D7. 1980-1989 monthly wave period distributions for Gage 625

Table D5
1989 Persistence of H_{mo} for Gage 625

Height (m)	Consecutive Day(s) or Longer																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19+
0.5	29	26	22	21	18	15	13	10				9	8		7	6		5	4
1.0	35	20	15	12		9	5			4	3	2		1					
1.5	23	13	8	6		4													
2.0	13	9	4	2	1														
2.5	5	4	3	1															
3.0	3	3	2																
3.5	1																		

Table D6
1980 Through 1989 Persistence of H_{mo} for Gage 625

Height (m)	Consecutive Day(s) or Longer																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19+
0.5	28	25	21	19	16	14	12	11	10		9	8		7	6	5		4	3
1.0	44	31	21	15	10	7	5	4	3	2			1						
1.5	29	16	9	5	3	2	1												
2.0	15	8	4	2	1														
2.5	8	4	2	1															
3.0	3	1																	
3.5	1																		
4.0																			

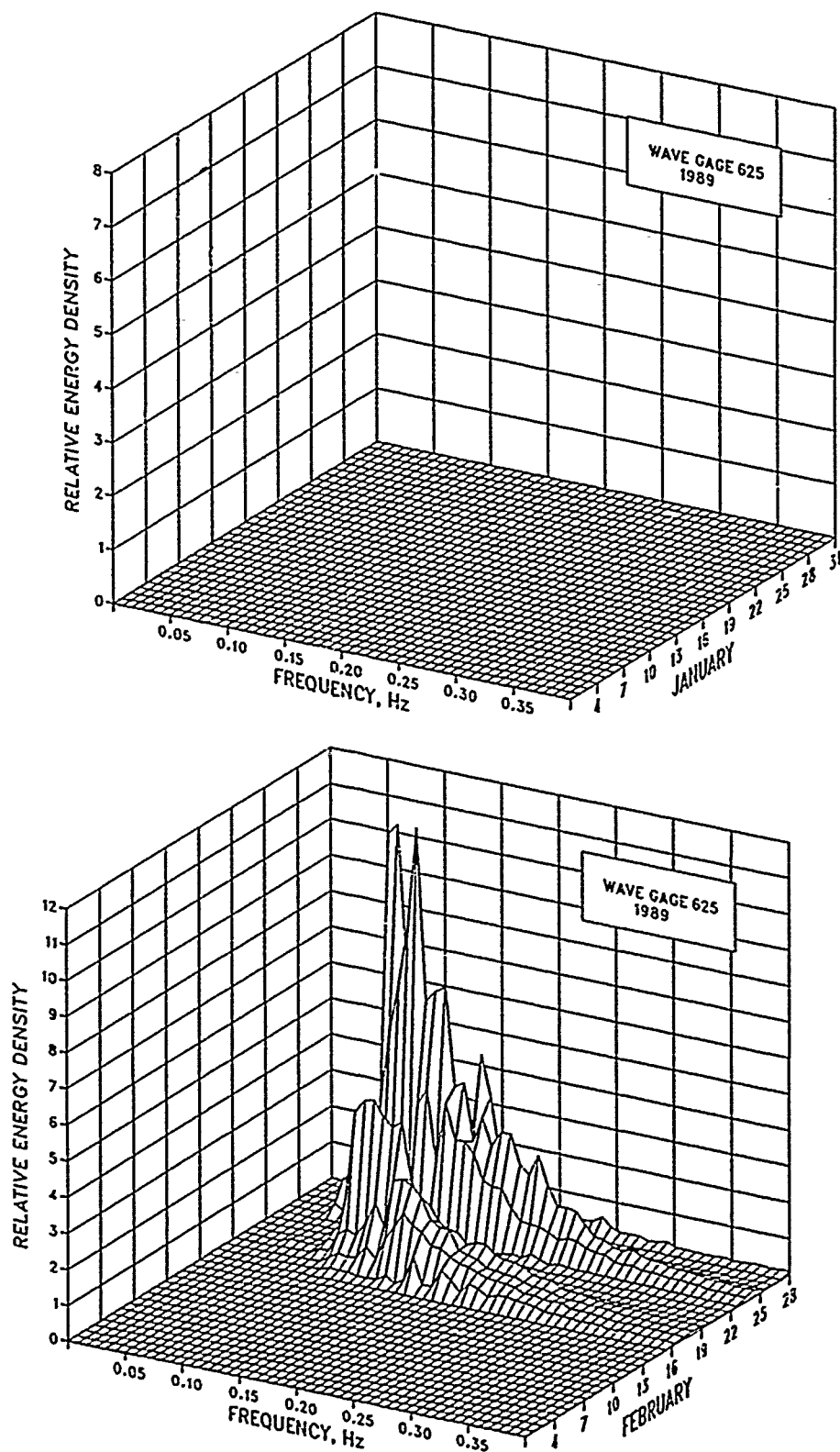


Figure D8. 1989 monthly spectra for Gage 625
(Sheet 1 of 6)

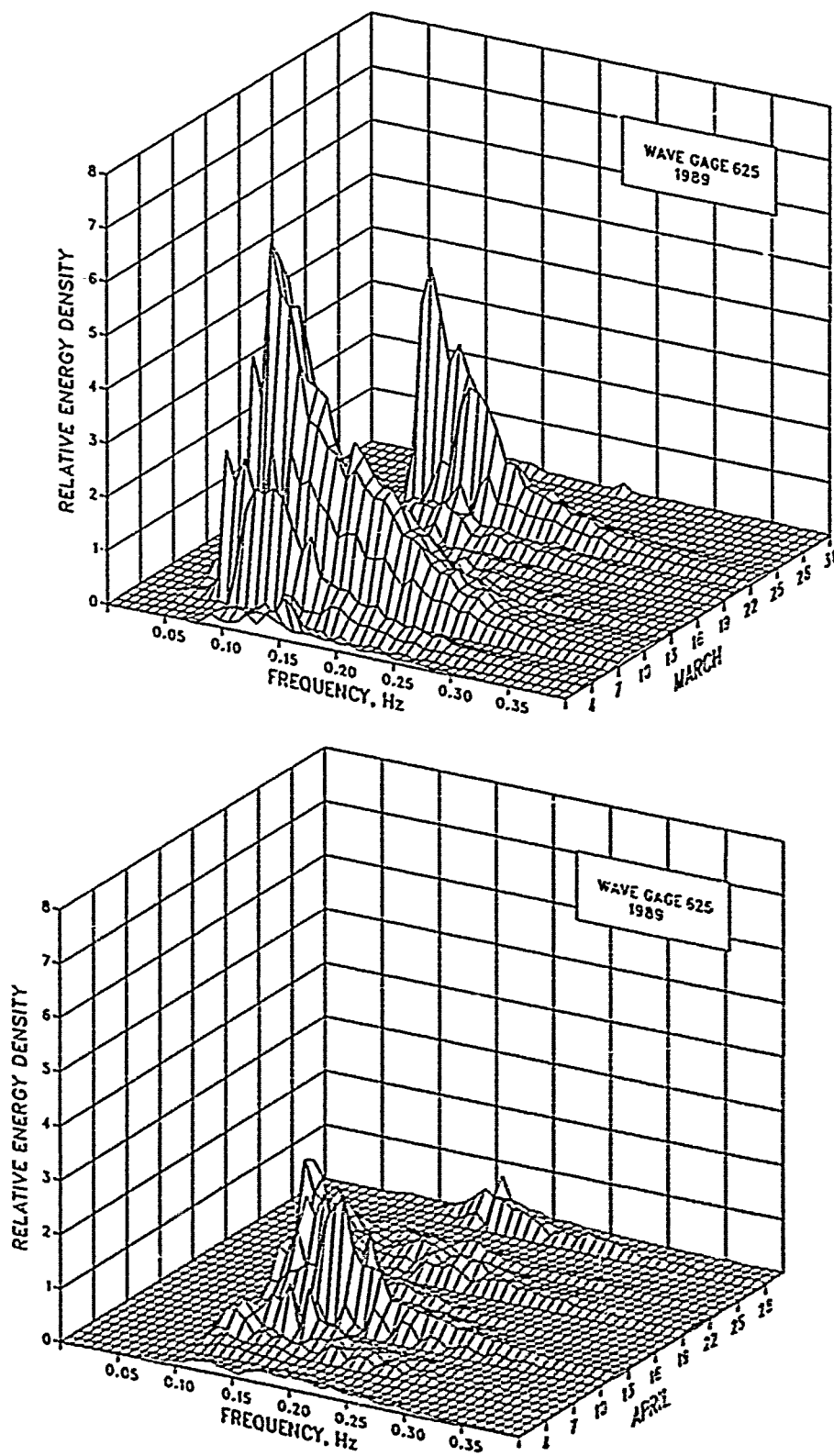


Figure D8. (Sheet 2 of 6)

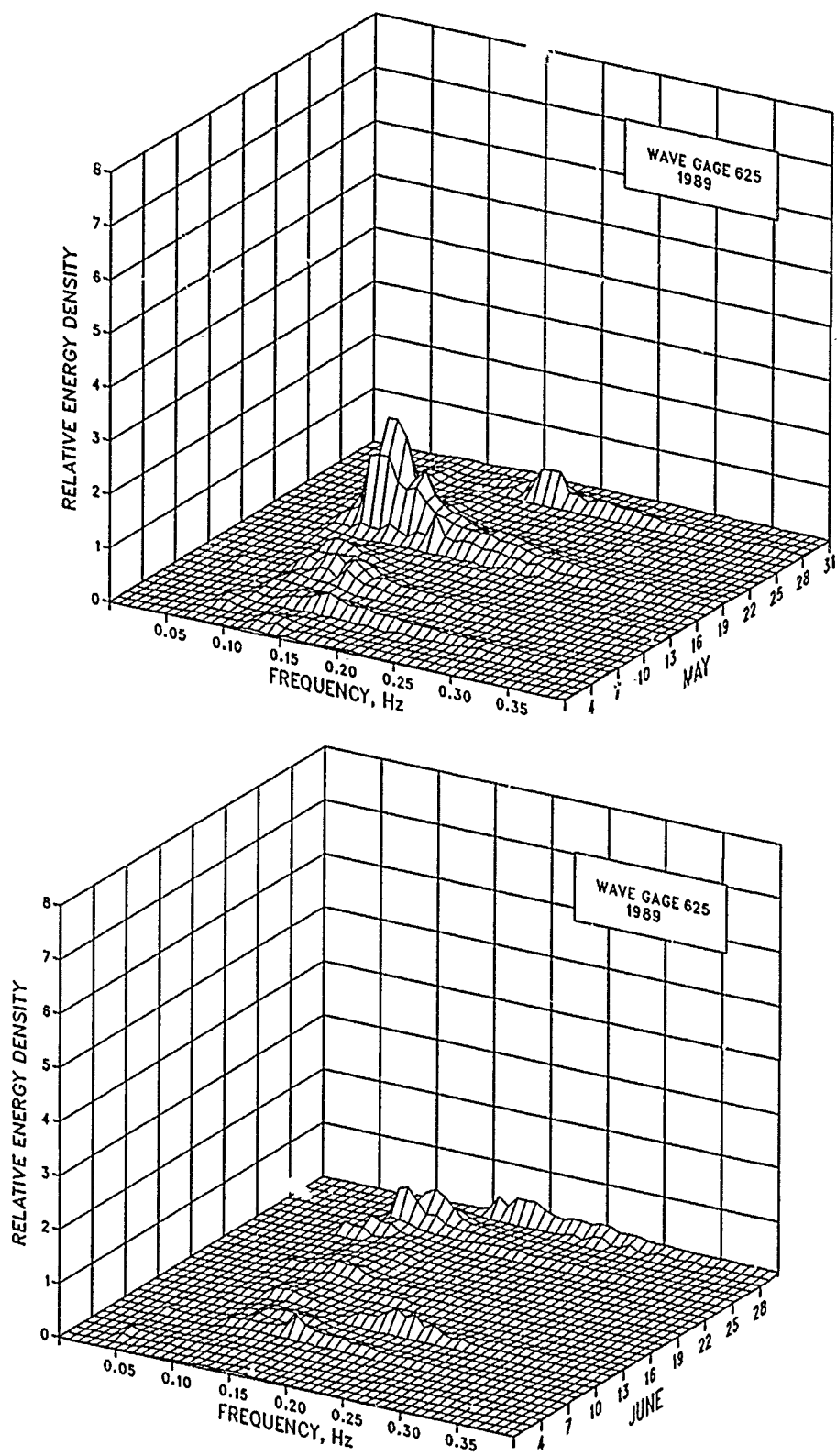


Figure D8. (Sheet 3 of 6)

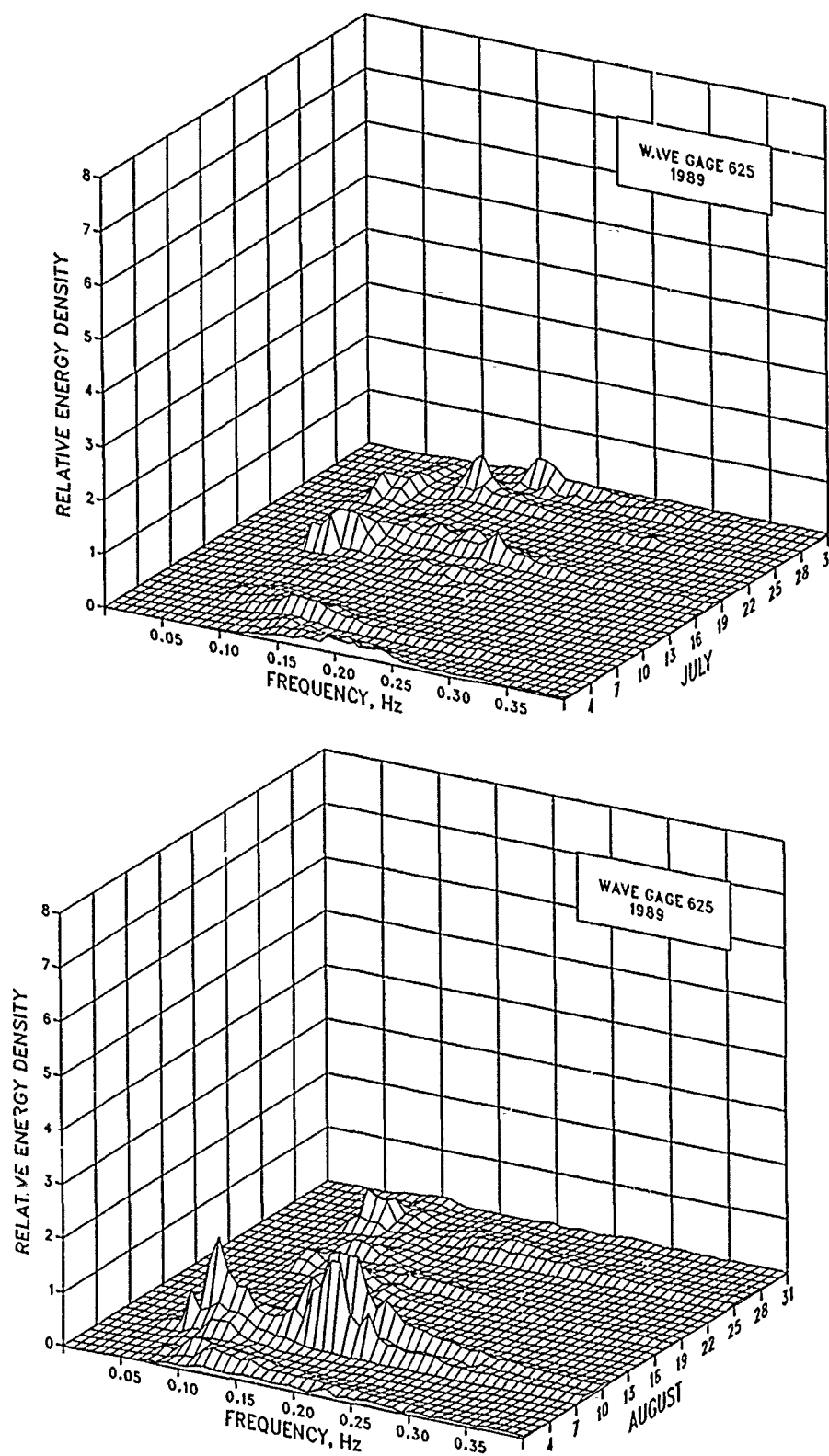


Figure D8. (Sheet 4 of 6)

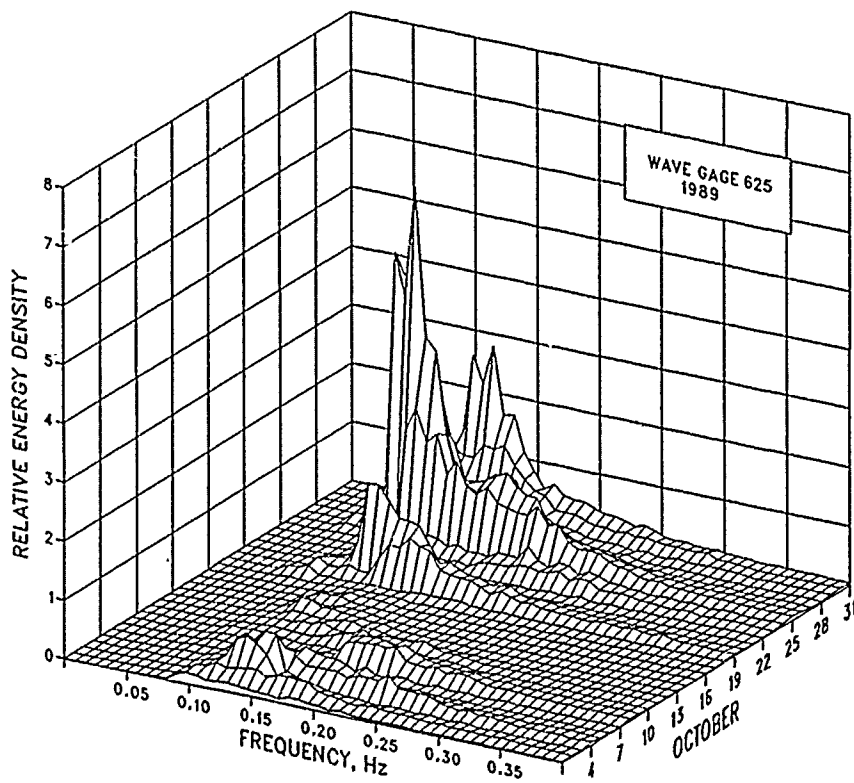
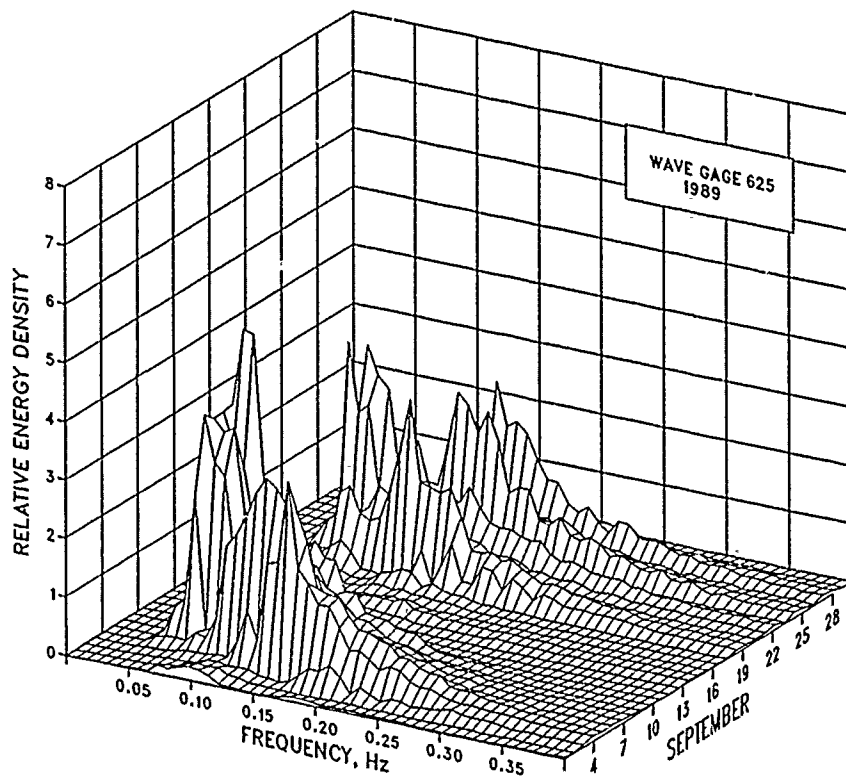


Figure D8. (Sheet 5 of 6)

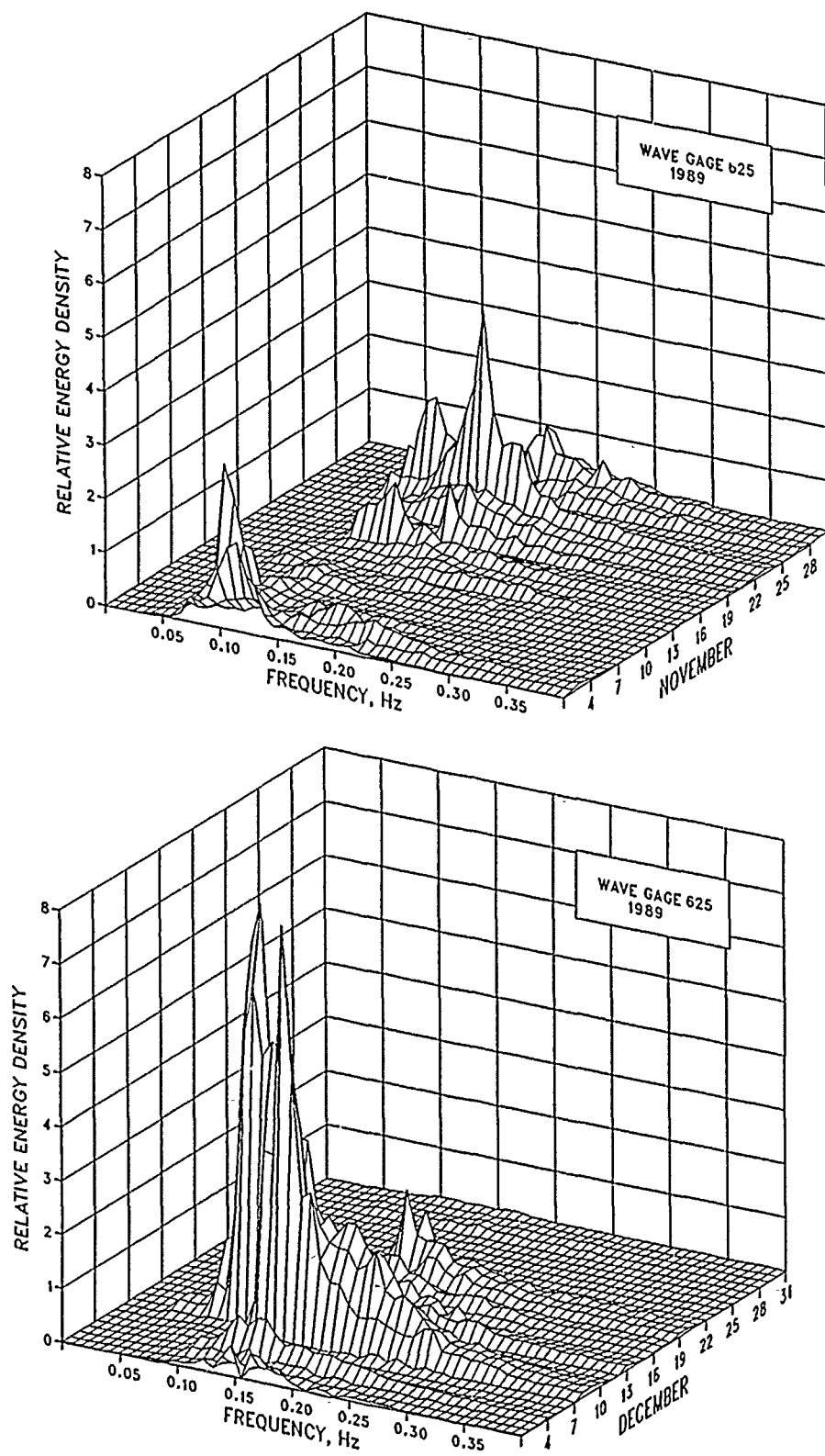


Figure D8. (Sheet 6 of 6)

Table D7
Wave Statistics for Gage 625

Month	1989							1980-1989						
	Height				Period			Height				Period		
	Std.			Date	Std.		Number	Std.			Date	Std.		Number
	Mean	Dev.	Extreme		Mean	Dev.		Mean	Dev.	Extreme		Mean	Dev.	
	m	m	m		sec	sec		m	m	m		sec	sec	
Jan							0	1.1	0.6	3.5	1988	8.5	2.7	949
Feb	1.7	0.9	3.8	24	8.9	2.5	48	1.1	0.7	3.8	1989	9.0	2.7	975
Mar	1.3	0.8	3.3	8	8.9	2.2	123	1.1	0.7	3.4	1983	9.0	2.6	1124
Apr	0.9	0.4	1.9	11	8.7	2.5	118	0.9	0.6	3.4	1988	9.4	2.6	1049
May	0.7	0.3	1.6	20	9.7	3.3	124	0.8	0.5	3.0	1986	8.7	2.6	1141
Jun	0.5	0.2	1.0	11	8.5	1.9	113	0.7	0.4	2.3	1983	8.2	2.3	964
Jul	0.6	0.2	1.1	18	9.0	3.1	123	0.6	0.3	1.8	1985	8.7	2.8	896
Aug	0.7	0.4	1.8	8	9.1	2.6	121	0.7	0.4	3.1	1981	8.5	2.6	966
Sep	1.3	0.7	2.5	4	9.7	3.2	120	1.0	0.6	3.0	1983	9.2	2.8	904
Oct	1.0	0.6	2.4	25	9.1	3.2	124	1.1	0.7	3.5	1980	9.2	2.9	1169
Nov	0.9	0.4	2.2	23	8.6	2.7	120	1.0	0.6	3.5	1981	8.7	3.0	1074
Dec	1.0	0.8	3.0	9	9.0	3.2	90	1.0	0.6	3.1	1986	9.0	3.1	943
Annual	0.9	0.6	3.8	Feb	9.0	2.8	1224	0.9	0.6	3.8	Feb 1989	8.9	2.8	12154

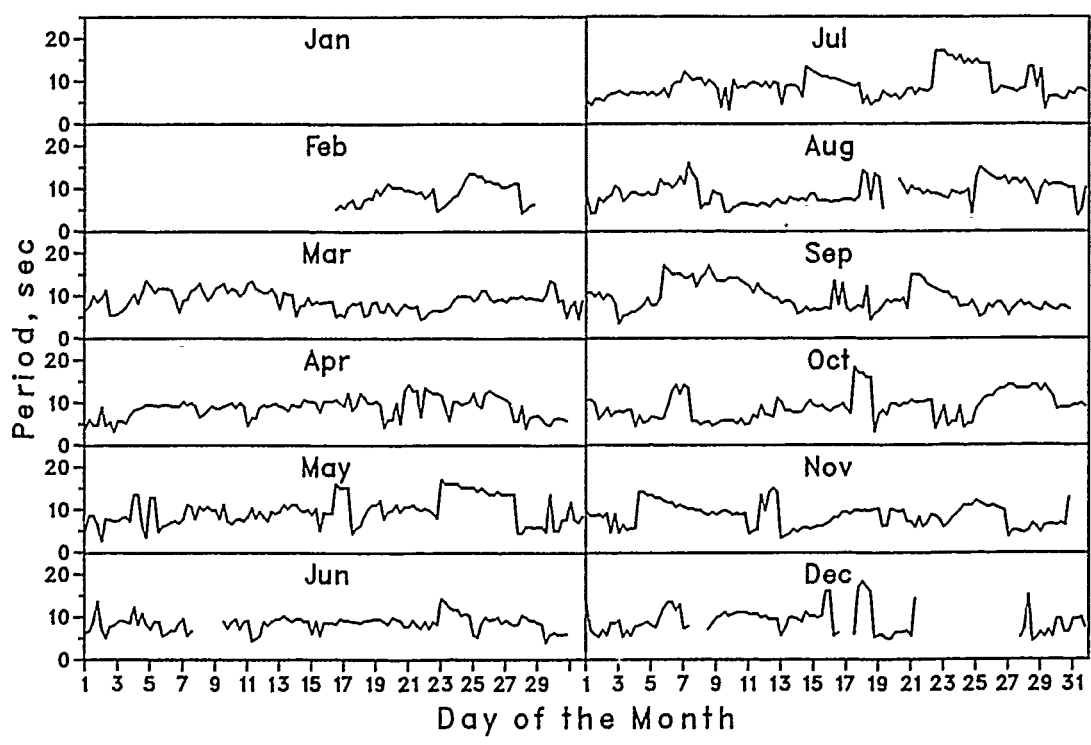
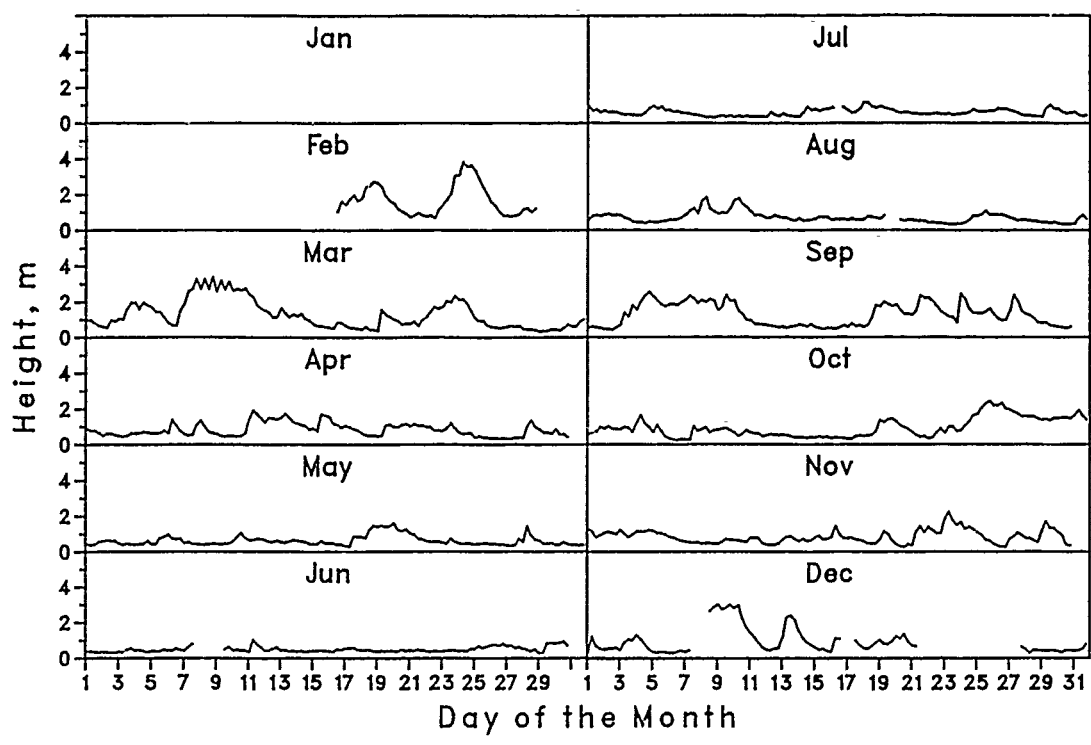


Figure D9. Time-histories of wave height and period for Gage 625

APPENDIX E: WAVE DATA FOR GAGE 645

1. Wave data summaries for Gage 645 are presented for 1989 and for 1980 through 1989 in the following forms:

Daily H_{mo} and T_p

2. Figure E1 displays the individual wave height and peak spectral wave period values along with the monthly mean values.

Joint Distributions of H_{mo} and T_p

3. Annual and monthly joint distributions tables are presented in Tables E1 and E2, and data for 1980 through 1989 are in Tables E3 and E4. Each table gives the frequency (in parts per 10,000) for which the wave height and peak period were within the specified intervals; these values can be converted to percentages by dividing by 100. Marginal totals are also included. The row total gives the total number of observations out of 10,000 that fell within each specified peak period interval. The column total gives the number of observations out of 10,000 that fell within each specified wave height interval.

Cumulative Distributions of Wave Height

4. Annual and monthly wave height distributions for 1989 are plotted in cumulative form in Figures E2 and E3. Data for 1980 through 1989 are in Figure E4.

Peak Spectral Wave Period Distributions

5. Annual and monthly peak wave period, T_p , distribution histograms for 1989 are presented in Figures E5 and E6. Data for 1980 through 1989 are in Figure E7.

Persistence of Wave Heights

6. Table E5 shows the number of times in 1989 when the specified wave height was equaled or exceeded at least once during each day for the duration (consecutive days). Data for 1980 through 1989 are given in Table E6. An example is shown below:

Height m	Consecutive Day(s) or Longer																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19+
0.5	18	15	3	14	13	12	7	11	10	9				8		7			
1.0	50	34	24	21	18	14	12	8	7	3			2						
1.5	41	19	8	6	2	1													
2.0	22	9	5	1															
2.5	10	5	2																
3.0	6	1																	
3.5		1																	
4.0	1																		

This example indicates that wave heights equaled or exceeded 1.0 m 50 times for at least 1 day; 34 times for at least 2 days; 24 times for at least 3 days, etc. Therefore, on 16 occasions the height equaled or exceeded 1.0 m for 1 day exactly ($50 - 34 = 16$); on 10 occasions for 2 days; on 3 occasions for 3 days, etc. Note that the height exceeded 1 m 50 times for 1 day or longer, while heights exceeded 0.5 m only 18 times for this same duration. This change in durations occurred because the longer durations of lower waves may be interspersed with shorter, but more frequent, intervals of higher waves. For example, one of the times that the wave heights exceeded 0.5 m for 16 days may have represented 3 times the height exceeded 1 m for shorter durations.

Spectra

7. Monthly spectra for the offshore Waverider buoy (Gage 645) are presented in Figure E8. The plots show "relative" energy density as a function of wave frequency. These figures summarize the large number of spectra for each month. The figures emphasize the higher energy density associated with storms as well as the general shifts in energy density to different frequencies. As used here, "relative" indicates the spectra have been smoothed by the three-dimension surface drawing routine. Consequently, extremely high- and low-energy density values are modified to produce a smooth

surface. The figures are not intended for quantitative measurements; however, they do provide the energy density as a function of frequency relative to the other spectra for the month.

8. Monthly and annual wave statistics for Gage 645 for 1989 and for 1980 through 1989 are presented in Table E7.

9. Figure E9 plots monthly time-histories of wave height and period.

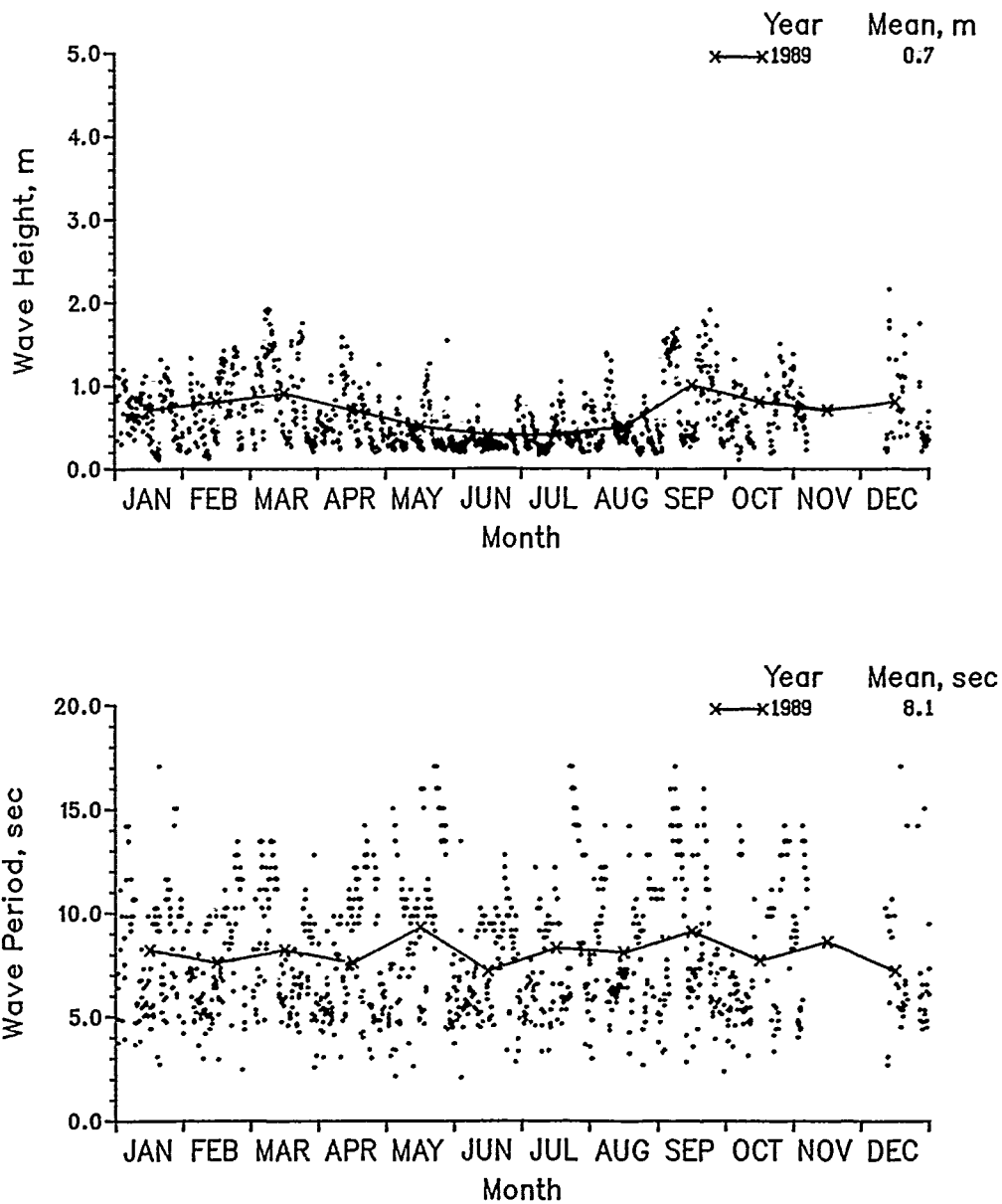


Figure E1. 1989 daily wave height and period values with monthly means for Gage 645

Table E1

Annual Joint Distribution of H_{mo} versus T_p

Annual 1989, Gage 645 Percent Occurrence(X100) of Height and Period													
Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- longer	
0.00 - 0.49	117	175	458	741	491	491	416	866	766	200	383	50	5154
0.50 - 0.99	.	108	475	916	525	108	142	183	283	142	167	8	3057
1.00 - 1.49	.	.	33	250	291	142	125	83	233	125	133	.	1415
1.50 - 1.99	.	.	.	17	58	67	25	33	58	33	67	8	366
2.00 - 2.49	8	.	.	.	.	.	.	8
2.50 - 2.99	0
3.00 - 3.49	0
3.50 - 3.99	0
4.00 - 4.49	0
4.50 - 4.99	0
5.00 - Greater	117	283	966	1924	1365	816	708	1165	1340	500	750	66	0

Table E2
Monthly Joint Distribution of H_{mo} versus T_p

January 1989, Gage 645 Percent Occurrence(X100) of Height and Period													
Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	85	171	171	342	85	171	85	1111	769	171	171	85	3417
0.50 - 0.99	.	256	598	1282	940	342	171	769	427	427	.	.	5212
1.00 - 1.49	.	.	85	85	427	85	171	.	513	.	.	.	1366
1.50 - 1.99	0
2.00 - 2.49	0
2.50 - 2.99	0
3.00 - 3.49	0
3.50 - 3.99	0
4.00 - 4.49	0
4.50 - 4.99	0
5.00 - Greater	85	427	854	1709	1452	598	427	1880	1709	598	171	85	0

February 1989, Gage 645 Percent Occurrence(X100) of Height and Period													
Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	300	.	100	500	600	400	100	900	600	.	.	.	3500
0.50 - 0.99	.	100	900	1000	300	100	300	200	300	.	100	.	3300
1.00 - 1.49	.	.	.	500	500	700	200	300	500	100	400	.	3200
1.50 - 1.99	0
2.00 - 2.49	0
2.50 - 2.99	0
3.00 - 3.49	0
3.50 - 3.99	0
4.00 - 4.49	0
4.50 - 4.99	0
5.00 - Greater	300	100	1000	2000	1400	1200	600	1400	1400	100	500	0	0

March 1989, Gage 645 Percent Occurrence(X100) of Height and Period													
Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	84	84	336	756	420	252	588	504	252	.	84	.	3360
0.50 - 0.99	.	.	504	756	504	.	168	84	588	.	84	.	2688
1.00 - 1.49	.	.	.	84	588	252	252	.	588	420	252	.	2436
1.50 - 1.99	.	.	.	84	252	84	168	168	336	84	336	.	1512
2.00 - 2.49	0
2.50 - 2.99	0
3.00 - 3.49	0
3.50 - 3.99	0
4.00 - 4.49	0
4.50 - 4.99	0
5.00 - Greater	84	84	840	1680	1764	588	1176	756	1764	504	756	0	0

(Continued)

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Table E2 (Continued)

April 1989, Gage 645
Percent Occurrence(X100) of Height and Period

Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	.	261	783	1043	174	87	87	1043	696	.	261	.	4435
0.50 - 0.99	.	87	522	1130	522	174	174	87	609	261	522	.	4088
1.00 - 1.49	.	.	87	435	348	261	.	174	87	.	.	.	1392
1.50 - 1.99	87	.	.	.	.	.	.	.	87
2.00 - 2.49	0
2.50 - 2.99	0
3.00 - 3.49	0
3.50 - 3.99	0
4.00 - 4.49	0
4.50 - 4.99	0
5.00 - Greater	0	348	1392	2608	1131	522	261	1304	1392	261	783	0	0

May 1989, Gage 645
Percent Occurrence(X100) of Height and Period

Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	163	407	894	488	163	569	407	732	1220	813	1301	163	7320
0.50 - 0.99	.	.	407	407	407	.	244	244	407	.	.	81	2197
1.00 - 1.49	407	.	.	.	407
1.50 - 1.99	.	.	.	81	.	.	.	.	.	.	.	.	81
2.00 - 2.49	0
2.50 - 2.99	0
3.00 - 3.49	0
3.50 - 3.99	0
4.00 - 4.49	0
4.50 - 4.99	0
5.00 - Greater	163	407	1301	976	570	569	651	976	2034	813	1301	244	0

June 1989, Gage 645
Percent Occurrence(X100) of Height and Period

Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	174	174	609	2261	1043	1130	957	1826	696	87	174	.	9131
0.50 - 0.99	.	87	174	435	174	.	.	.	.	.	.	.	870
1.00 - 1.49	0
1.50 - 1.99	0
2.00 - 2.49	0
2.50 - 2.99	0
3.00 - 3.49	0
3.50 - 3.99	0
4.00 - 4.49	0
4.50 - 4.99	0
5.00 - Greater	174	261	783	2696	1217	1130	957	1826	696	87	174	0	0

(Continued)

(Sheet 2 of 4)

Table E2 (Continued)

July 1989, Gage 645
Percent Occurrence(X100) of Height and Period

Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- longer	
0.00 - 0.49	.	250	667	1250	750	583	1000	917	500	500	917	167	7501
0.50 - 0.99	.	83	167	833	833	83	.	83	167	.	167	.	2416
1.00 - 1.49	.	.	.	83	.	.	.	.	.	.	.	.	83
1.50 - 1.99	0
2.00 - 2.49	0
2.50 - 2.99	0
3.00 - 3.49	0
3.50 - 3.99	0
4.00 - 4.49	0
4.50 - 4.99	0
5.00 - Greater	0	333	834	2166	1583	666	1000	1000	667	500	1084	167	0

August 1989, Gage 645
Percent Occurrence(X100) of Height and Period

Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- longer	
0.00 - 0.49	167	.	500	167	917	1167	500	1167	1833	83	333	.	6334
0.50 - 0.99	.	167	.	1000	833	83	83	.	83	83	250	.	3082
1.00 - 1.49	.	.	.	167	417	.	.	.	.	.	.	.	584
1.50 - 1.99	0
2.00 - 2.49	0
2.50 - 2.99	0
3.00 - 3.49	0
3.50 - 3.99	0
4.00 - 4.49	0
4.50 - 4.99	0
5.00 - Greater	167	167	500	1334	2167	1250	583	1167	1916	166	583	0	0

September 1989, Gage 645
Percent Occurrence(X100) of Height and Period

Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- longer	
0.00 - 0.49	171	171	171	427	342	684	171	256	513	85	256	.	3247
0.50 - 0.99	.	171	85	513	256	171	171	85	171	85	342	.	2050
1.00 - 1.49	.	.	.	769	256	171	342	171	171	598	598	.	3076
1.50 - 1.99	171	513	85	.	171	256	342	85	1623
2.00 - 2.49	0
2.50 - 2.99	0
3.00 - 3.49	0
3.50 - 3.99	0
4.00 - 4.49	0
4.50 - 4.99	0
5.00 - Greater	171	342	255	1709	1025	1539	769	512	1026	1024	1538	85	0

(Continued)

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Table E2 (Concluded)

October 1989, Gage 645
Percent Occurrence(X100) of Height and Period

Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	.	244	732	300	244		225	244	488	244	244	.	3172
0.50 - 0.99	.	244	732	1585	854	122		122	244	366	122	.	4391
1.00 - 1.49	.	.	122	244	244	122	488	366	244	244	244	.	2318
1.50 - 1.99	122	.	.	.	122
2.00 - 2.49	0
2.50 - 2.99	0
3.00 - 3.49	0
3.50 - 3.99	0
4.00 - 4.49	0
4.50 - 4.99	0
5.00 - Greater	0	488	1586	2195	1342	244	854	732	1098	854	610	0	0

November 1989, Gage 645
Percent Occurrence(X100) of Height and Period

Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	.	.	2509	1739	.	.	435		1304		435	.	2174
0.50 - 0.99	435	870		1304	870	.	7827
1.00 - 1.49	0
1.50 - 1.99	0
2.00 - 2.49	0
2.50 - 2.99	0
3.00 - 3.49	0
3.50 - 3.99	0
4.00 - 4.49	0
4.50 - 4.99	0
5.00 - Greater	0	0	2509	1739	0	0	870	870	1304	1304	1305	0	0

December 1989, Gage 645
Percent Occurrence(X100) of Height and Period

Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	200	200	1000	400	1000	.	.	200	400	200	200	200	4600
0.50 - 0.99	.	.	200	1600		200	200	200	.	200	.	.	2600
1.00 - 1.49	.	.	200	800	800	.	.	.	.	.	.	.	1800
1.50 - 1.99	200	200	.	400	.	.	.	.	800
2.00 - 2.49	200	.	.	.	.	.	.	200
2.50 - 2.99	0
3.00 - 3.49	0
3.50 - 3.99	0
4.00 - 4.49	0
4.50 - 4.99	0
5.00 - Greater	200	200	1400	2800	2000	600	200	1400	400	400	200	200	0

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Table E3

Annual Joint Distribution of H_{mo} versus T_p (All Years)

Annual 1980-1989, Gage 645													
Percent Occurrence(X100) of Height and Period													
Height, m	Period, sec												
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- longer	Total
0.00 - 0.49	79	132	250	447	303	296	526	577	664	330	379	68	4051
0.50 - 0.99	24	173	468	966	670	309	307	289	501	137	251	28	4123
1.00 - 1.49	.	1	50	332	355	161	106	87	183	94	147	7	1523
1.50 - 1.99	.	.	.	9	36	30	19	35	64	31	56	5	285
2.00 - 2.49	.	.	.	.	.	2	1	2	2	6	5	.	18
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	.	.	.	.	.	.	.	.	.	.	.	.	0
	103	306	768	1754	1364	798	959	990	1414	598	838	108	

Table E4
Monthly Joint Distribution of H_{mo} versus T_p (All Years)

January 1980-1989, Gage 645 Percent Occurrence(X100) of Height and Period													
Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	87	116	251	368	222	155	261	493	551	290	271	68	3133
0.50 - 0.99	29	184	406	1064	764	251	251	290	629	106	271	19	4264
1.00 - 1.49	.	.	68	629	658	309	203	77	242	39	174	.	2399
1.50 - 1.99	.	.	.	10	10	19	10	19	87	10	29	.	194
2.00 - 2.49	.	.	.	.	.	.	.	.	.	10	.	.	10
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	116	300	725	2071	1654	734	725	879	1509	455	745	87	0

February 1980-1989, Gage 645 Percent Occurrence(X100) of Height and Period													
Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	110	90	229	389	140	169	209	219	668	150	249	10	2632
0.50 - 0.99	50	179	419	1027	598	219	249	359	758	160	309	.	4327
1.00 - 1.49	.	.	50	618	598	259	130	140	349	219	219	.	2582
1.50 - 1.99	.	.	.	.	60	70	30	40	30	60	160	.	450
2.00 - 2.49	.	.	.	.	.	.	.	.	.	10	.	.	10
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	160	269	698	2034	1396	717	618	758	1805	599	937	10	0

March 1980-1989, Gage 645 Percent Occurrence(X100) of Height and Period													
Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	152	116	241	366	206	116	286	375	429	134	286	.	2707
0.50 - 0.99	54	223	429	1046	617	304	277	349	670	188	384	9	4550
1.00 - 1.49	.	9	107	357	411	188	134	98	277	188	277	.	2046
1.50 - 1.99	.	.	.	18	27	27	45	98	188	116	143	.	662
2.00 - 2.49	.	.	.	.	.	.	.	.	.	18	18	.	36
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	0
5.00 - Greater	206	348	777	1787	1261	635	742	920	1564	644	1108	9	0

(Continued)

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Table E4 (Continued)

April 1980-1989, Gage 645
Percent Occurrence(X100) of Height and Period

Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	68	166	273	380	263	302	439	556	595	439	439	29	3949
0.50 - 0.99	20	234	449	810	507	273	361	302	790	117	400	10	4273
1.00 - 1.49	.	.	39	263	273	107	117	137	234	78	176	.	1424
1.50 - 1.99	.	.	.	.	29	29	59	39	98	29	29	.	312
2.00 - 2.49	.	.	.	.	.	.	.	20	20	.	.	.	40
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	88	400	761	1453	1072	711	976	1054	1737	663	1044	39	0

May 1980-1989, Gage 645
Percent Occurrence(X100) of Height and Period

Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	83	193	275	459	312	385	679	633	807	275	495	64	4660
0.50 - 0.99	9	165	541	954	817	367	404	303	486	83	156	28	4313
1.00 - 1.49	.	.	28	156	128	55	92	92	165	55	119	.	890
1.50 - 1.99	.	.	.	28	37	.	.	9	18	18	18	.	128
2.00 - 2.49	.	.	.	.	.	.	9	.	.	.	.	.	9
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	92	358	844	1597	1294	807	1184	1037	1476	431	788	92	0

June 1980-1989, Gage 645
Percent Occurrence(X100) of Height and Period

Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	123	255	397	926	548	577	992	983	624	388	208	151	6172
0.50 - 0.99	28	189	435	851	463	274	369	284	312	38	28	28	3299
1.00 - 1.49	.	.	28	142	142	28	47	9	104	.	19	.	519
1.50 - 1.99	.	.	.	.	9	.	.	.	.	.	.	.	9
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	151	444	860	1919	1162	879	1408	1276	1040	426	255	179	0

(Continued)

(Sheet 2 of 4)

Table E4 (Continued)

July 1980-1989, Gage 645
Percent Occurrence(X100) of Height and Period

Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	65	203	434	702	555	582	1377	1137	887	416	518	139	7015
0.50 - 0.99	.	139	397	638	527	240	287	194	129	92	46	55	2744
1.00 - 1.49	.	.	9	129	37	18	28	.	18	.	.	.	239
1.50 - 1.99	0
2.00 - 2.49	0
2.50 - 2.99	0
3.00 - 3.49	0
3.50 - 3.99	0
4.00 - 4.49	0
4.50 - 4.99	0
5.00 - Greater	65	342	840	1469	1119	840	1692	1331	1034	508	564	194	0

August 1980-1989, Gage 645
Percent Occurrence(X100) of Height and Period

Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	54	162	216	622	649	523	848	884	884	370	379	18	5609
0.50 - 0.99	9	216	568	983	613	352	325	189	252	36	117	.	3660
1.00 - 1.49	.	.	27	180	180	72	18	18	45	36	63	.	639
1.50 - 1.99	.	.	.	.	18	27	9	.	27	9	.	.	90
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	63	378	811	1785	1460	974	1200	1091	1208	451	559	18	0

September 1980-1989, Gage 645
Percent Occurrence(X100) of Height and Period

Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	66	47	123	313	171	275	361	494	684	370	456	66	3426
0.50 - 0.99	47	123	427	798	608	456	361	408	503	247	437	19	4434
1.00 - 1.49	.	.	47	475	389	199	161	114	161	104	171	19	1840
1.50 - 1.99	.	.	.	9	47	66	9	9	19	28	66	9	262
2.00 - 2.49	.	.	.	.	.	.	.	.	.	9	19	.	28
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	113	170	597	1595	1215	996	892	1025	1367	758	1149	113	0

(Continued)

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Table E4 (Concluded)

October 1980-1989, Gage 645
Percent Occurrence(X100) of Height and Period

Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	37	55	119	202	193	138	321	339	606	257	394	73	2734
0.50 - 0.99	9	92	450	936	651	239	312	303	771	202	284	46	4295
1.00 - 1.49	.	.	46	431	431	294	174	193	349	202	220	28	2368
1.50 - 1.99	.	.	.	9	83	64	28	64	156	55	55	46	560
2.00 - 2.49	.	.	.	.	.	9	.	.	.	18	18	.	45
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	46	147	615	1578	1358	744	835	899	1882	734	971	193	0

November 1980-1989, Gage 645
Percent Occurrence(X100) of Height and Period

Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	30	50	218	297	168	168	278	268	446	387	387	40	2737
0.50 - 0.99	20	139	595	1100	912	496	287	278	416	287	268	59	4857
1.00 - 1.49	.	.	59	287	575	268	129	59	129	188	178	40	1912
1.50 - 1.99	.	.	.	20	79	50	10	99	99	40	89	.	486
2.00 - 2.49	.	.	.	.	.	.	.	.	10	.	.	.	10
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	50	189	872	1704	1734	982	704	704	1100	902	922	139	0

December 1980-1989, Gage 645
Percent Occurrence(X100) of Height and Period

Height, m	Period, sec												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	77	125	222	318	174	135	193	492	771	501	463	164	3635
0.50 - 0.99	10	193	501	1408	974	241	193	212	318	96	328	68	4542
1.00 - 1.49	.	.	96	347	482	145	48	116	125	29	154	.	1542
1.50 - 1.99	.	.	.	10	39	10	29	39	39	10	87	.	263
2.00 - 2.49	.	.	.	.	.	19	.	.	.	.	.	.	19
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	87	318	819	2083	1669	550	463	859	1253	636	1032	232	0

(Sheet 4 of 4)

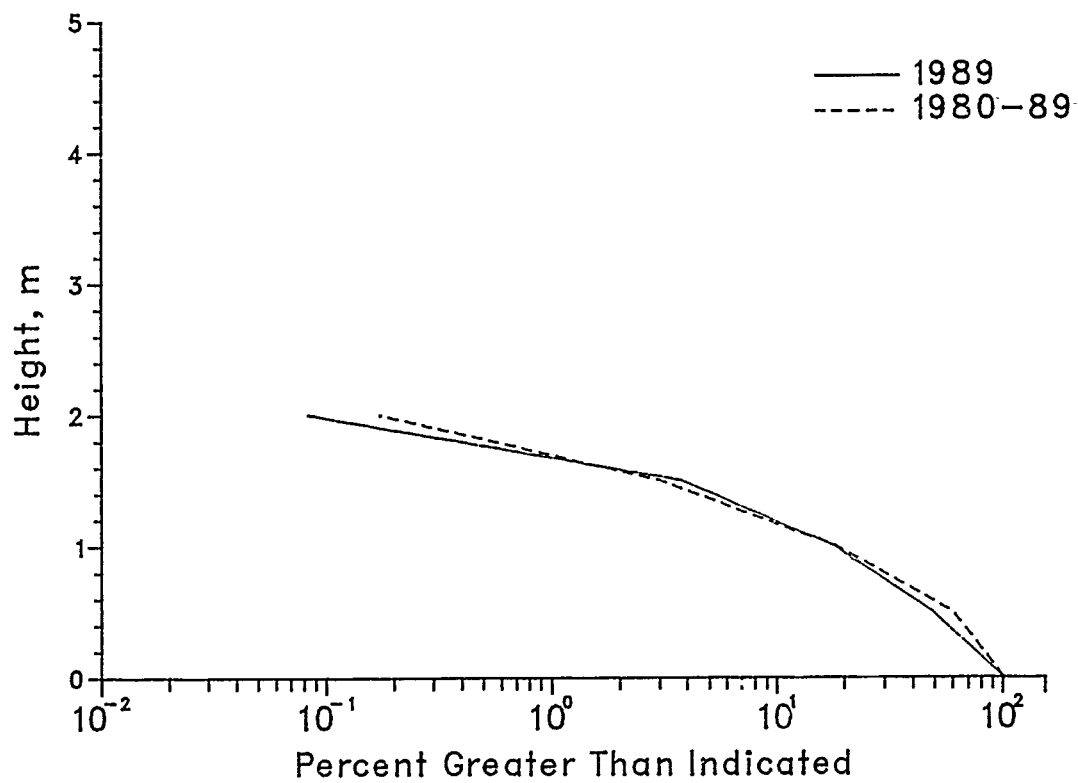


Figure E2. Annual cumulative wave height distributions
for Gage 645

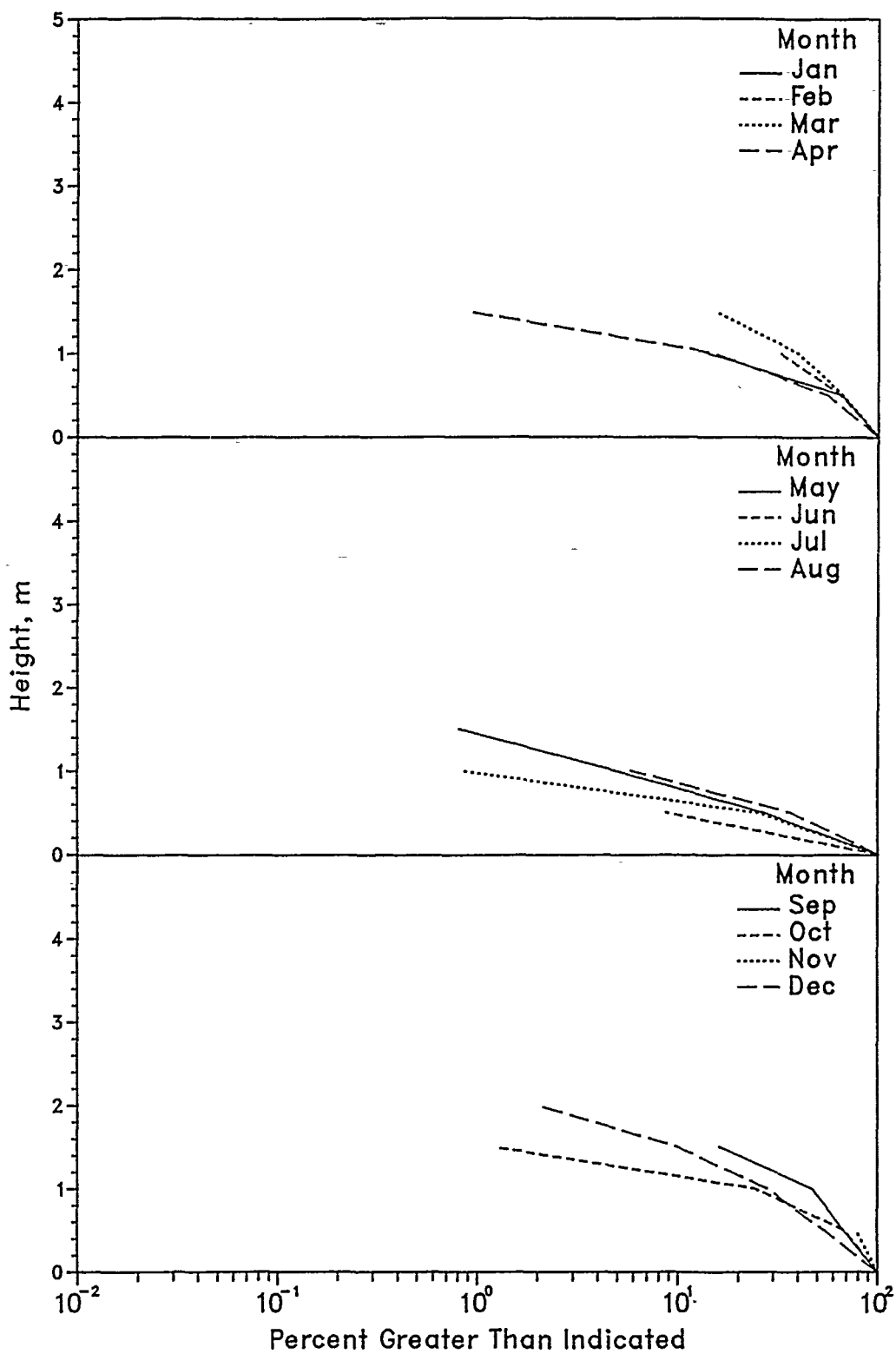


Figure E3. 1989 monthly wave height distributions
for Gage 645

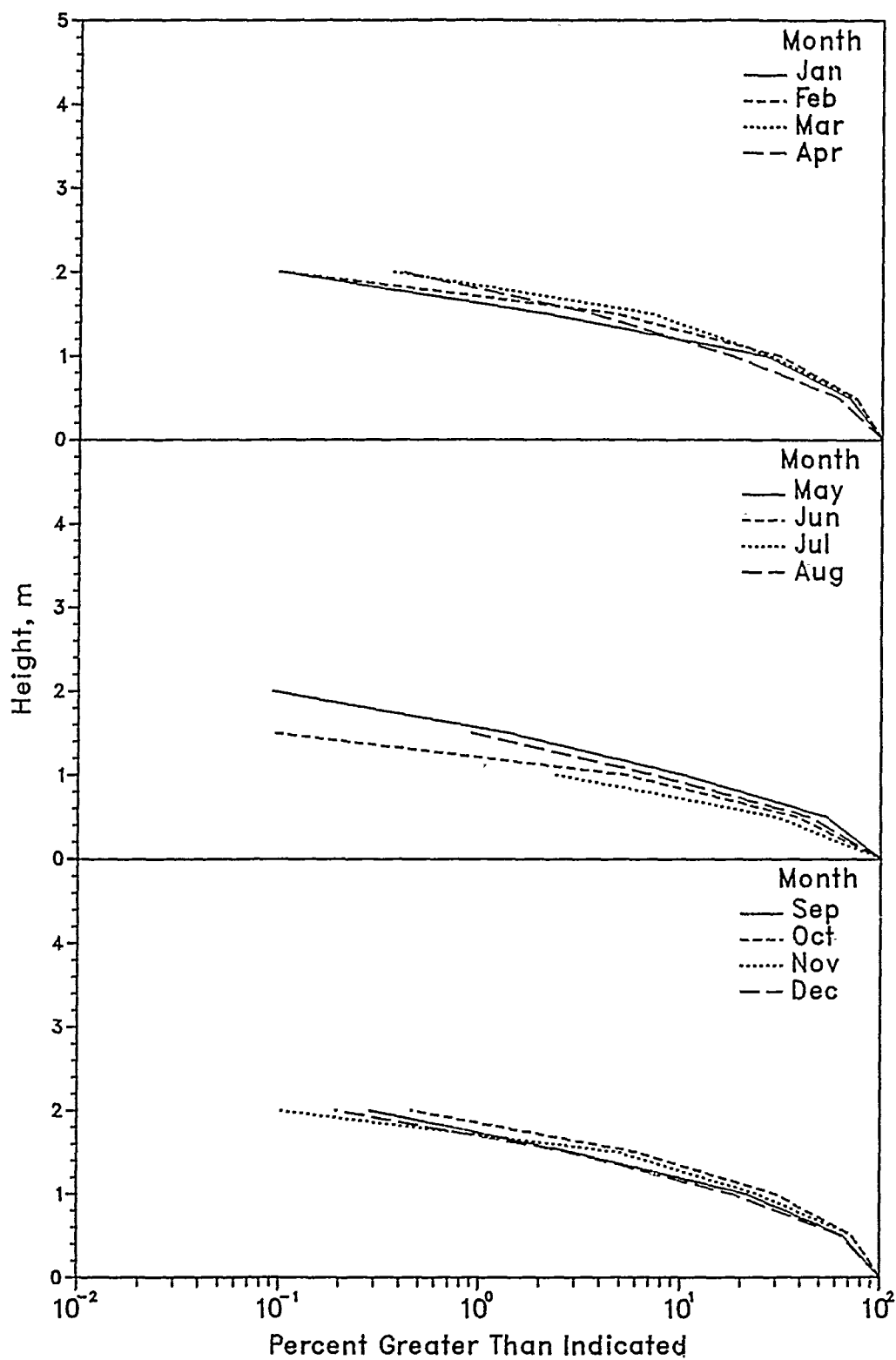


Figure E4. 1980-1989 monthly wave height distributions
for Gage 645

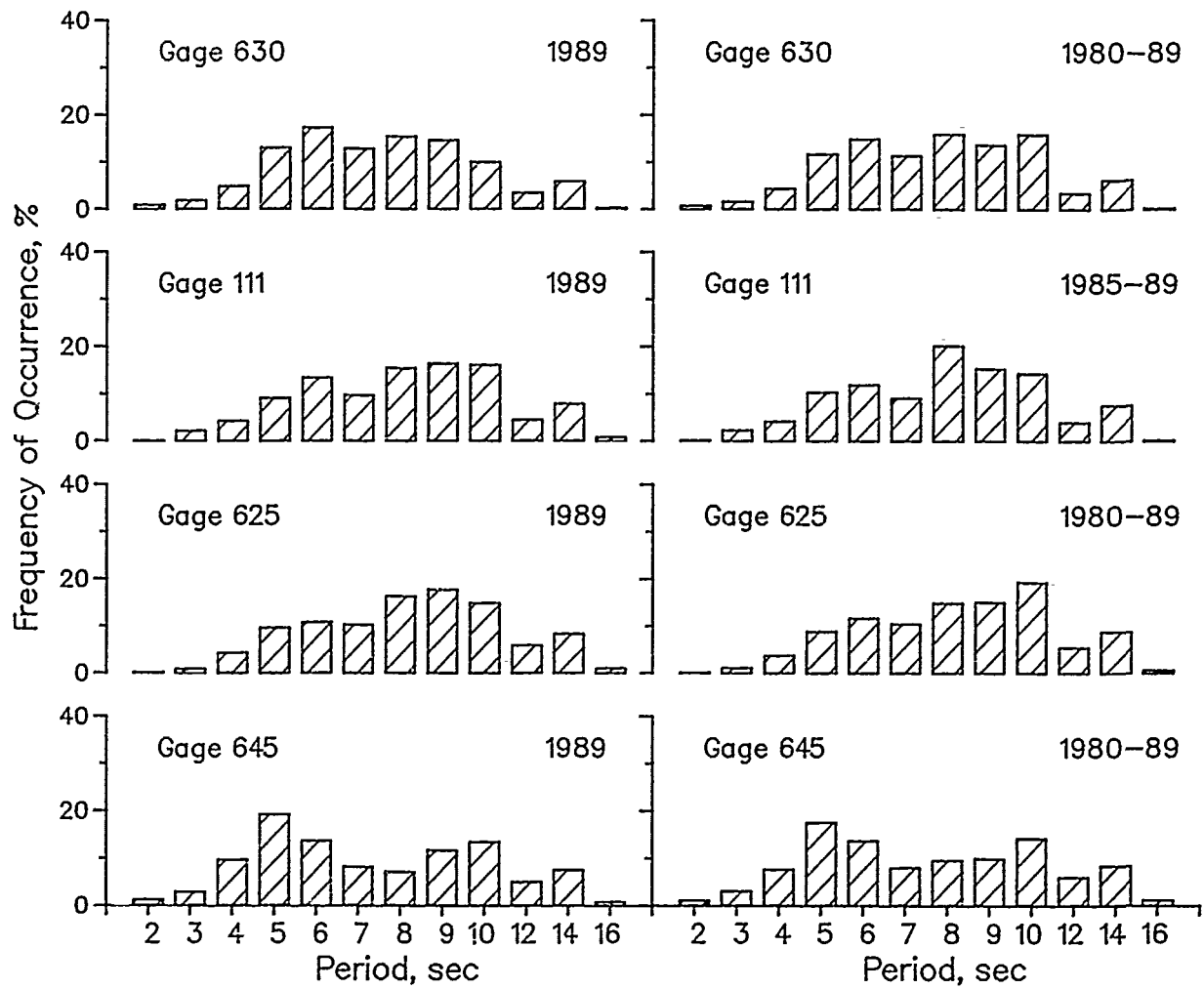


Figure E5. Annual wave period distributions for all gages

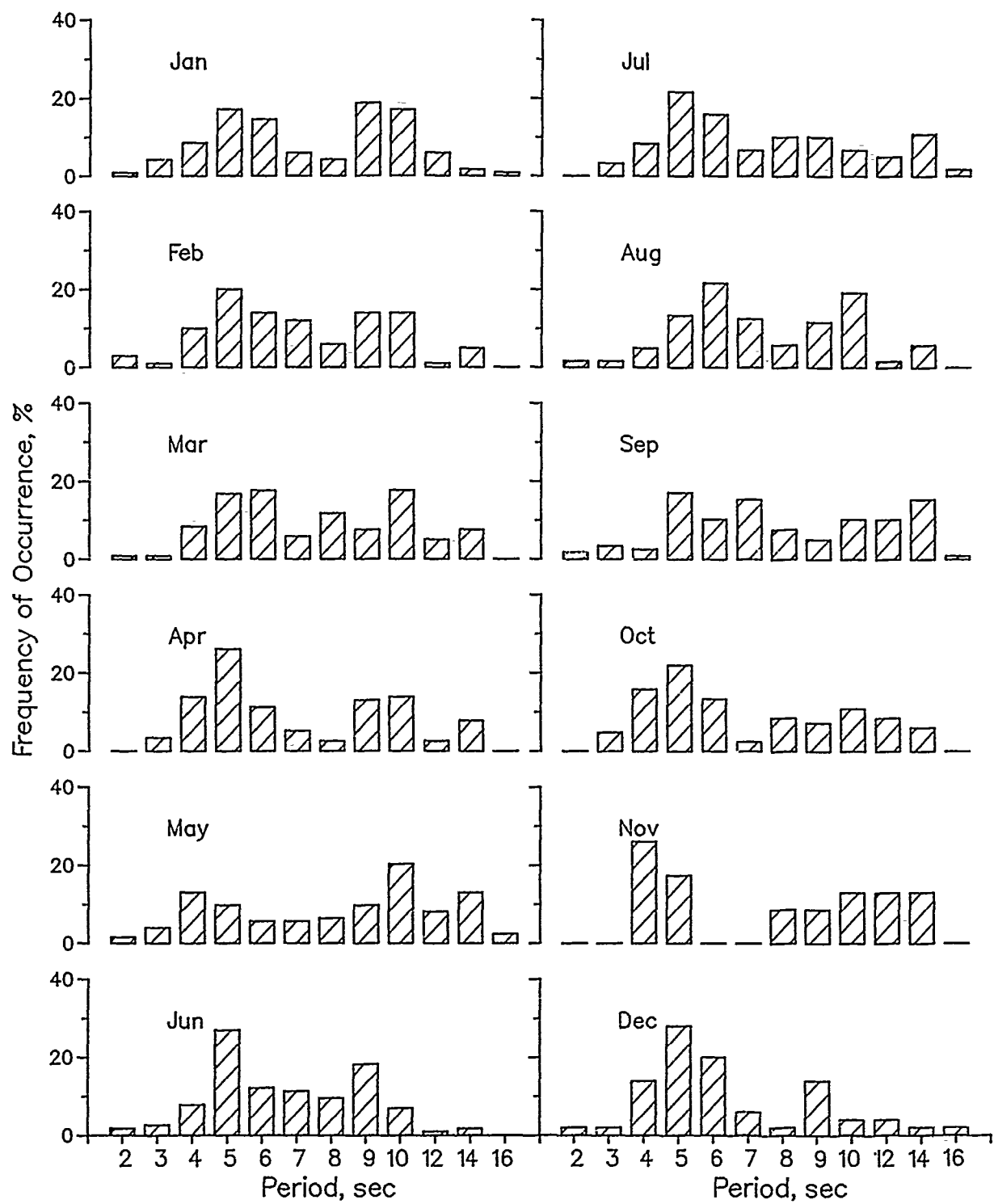


Figure E6. 1989 monthly wave period distributions for Gage 645

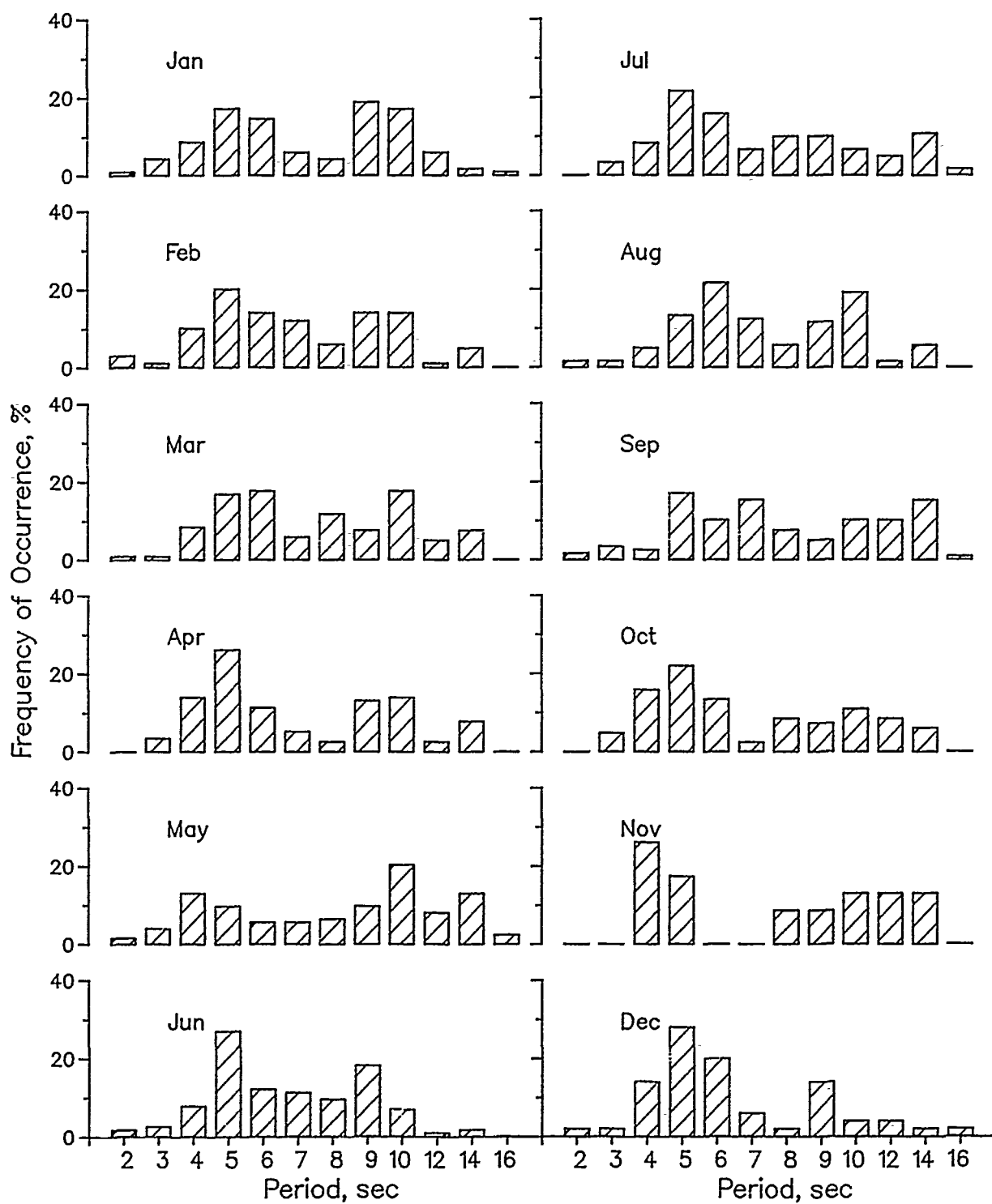


Figure E7. 1980-1989 monthly wave period distributions for Gage 645

Table E5
1989 Persistence of H_{mo} for Gage 645

Height (m)	Consecutive Day(s) or Longer																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19+
0.5	48	31		26	19	15	12	9		7				6		5		4	2
1.0	43	27	17	10	9		6	4	1										
1.5	22	11	8	5	3	2	1												
2.0		6	3	1															
2.5		3	2																
3.0		3	2																
3.5		2	1																
4.0		2																	

Table E6
1980 Through 1989 Persistence of H_{mo} for Gage 645

Height (m)	Consecutive Day(s) or Longer																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19+
0.5	43	35	29	24	19	15	12	11	9	8	7		6	5			4		3
1.0	43	25	15	9	5	3	2	1											
1.5	13	6	3		1														
2.0	2	1	1																
2.5																			
3.0																			
3.5																			
4.0																			

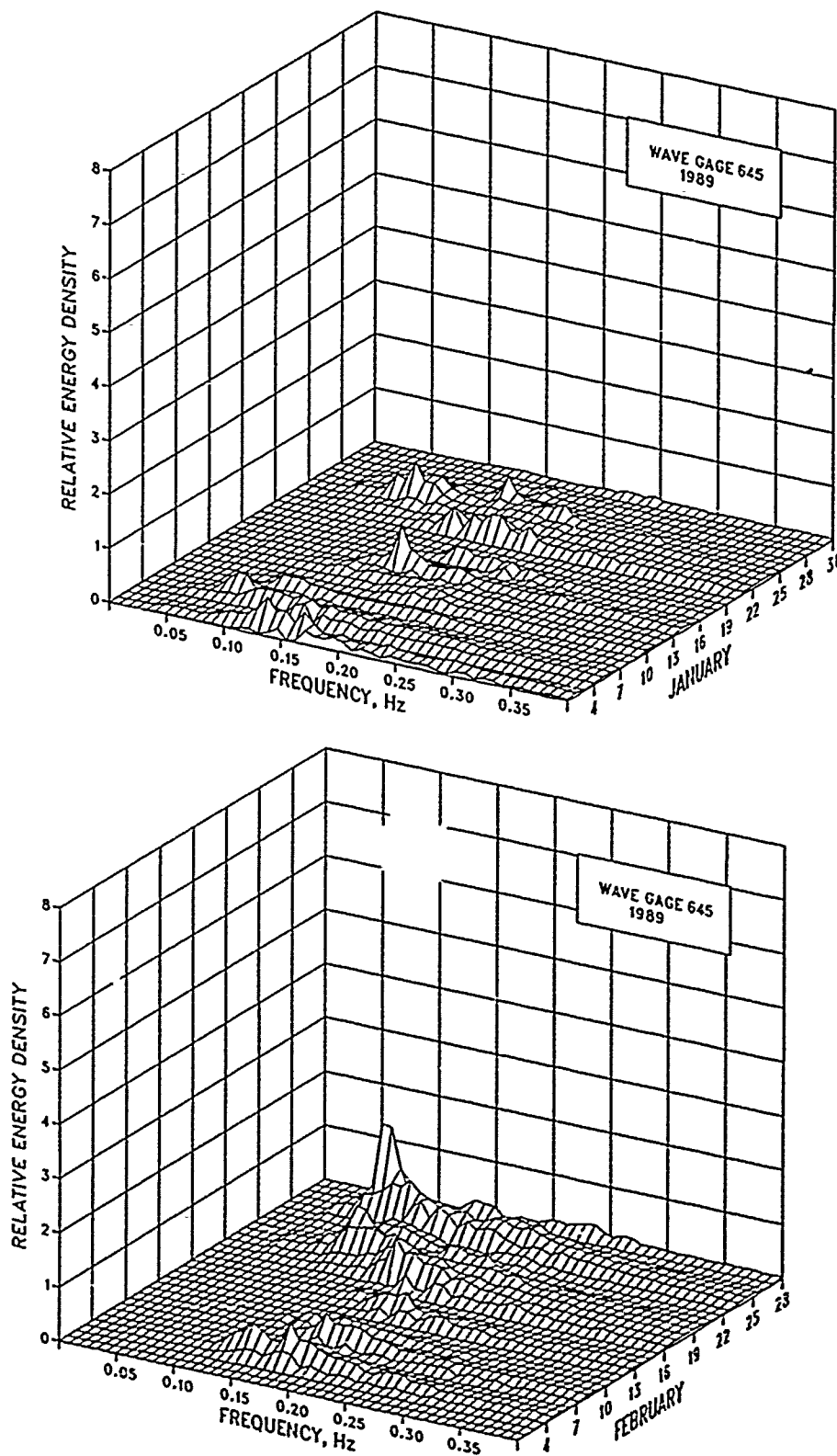


Figure E8. 1989 monthly spectra for Gage 645
(Sheet 1 of 6)

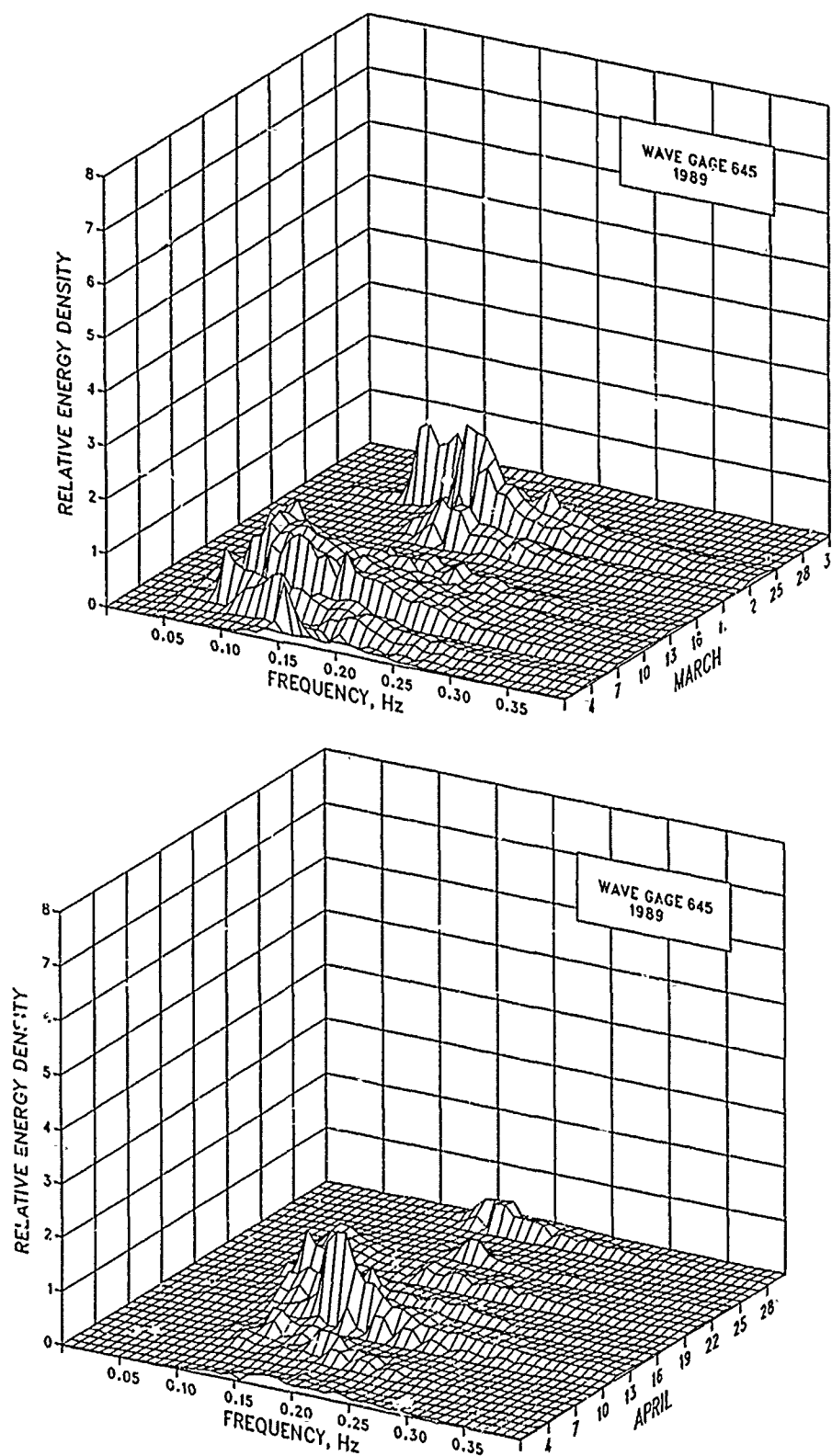


Figure E8. (Sheet 2 of 6)

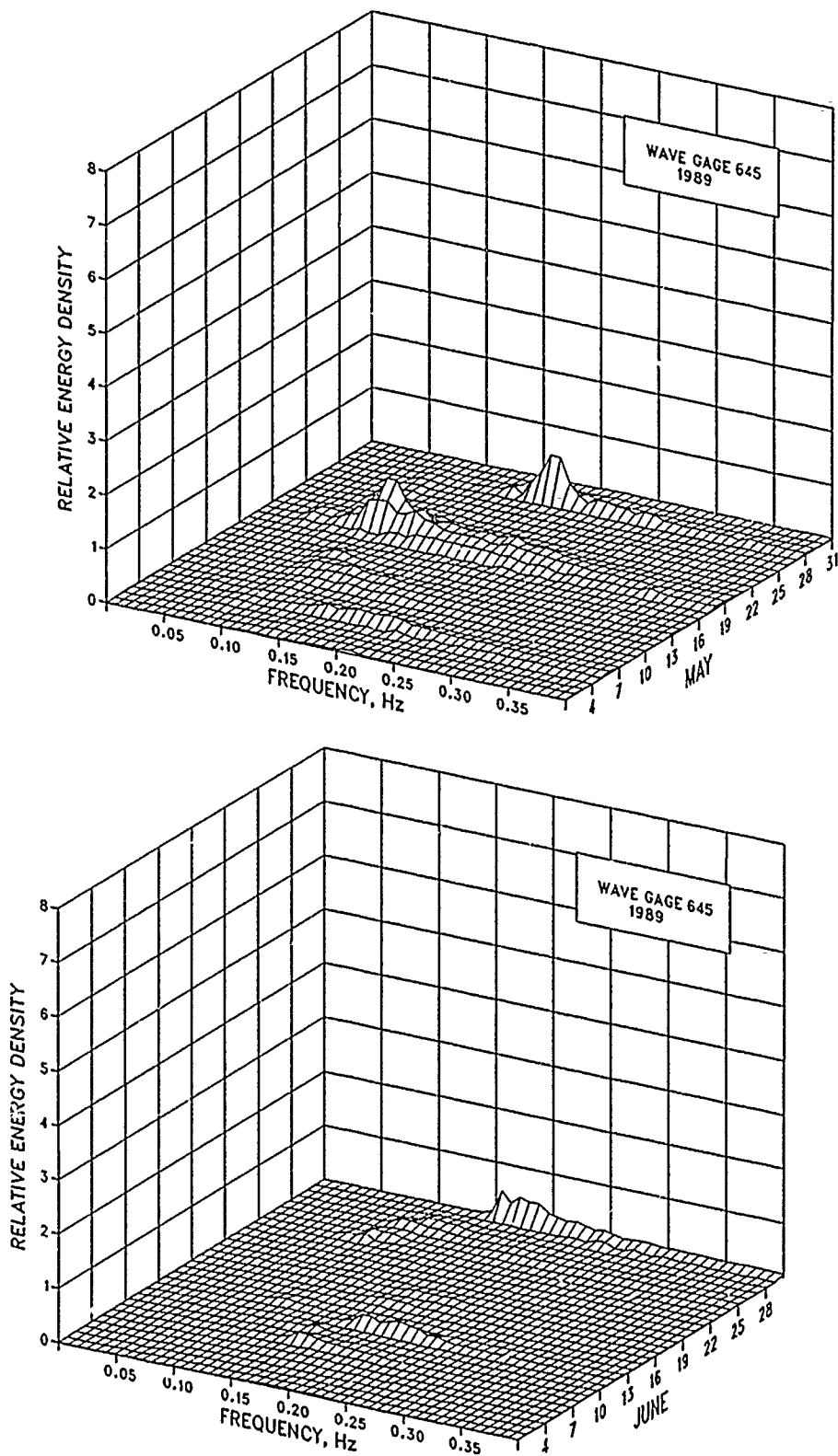


Figure E8. (Sheet 3 of 6)

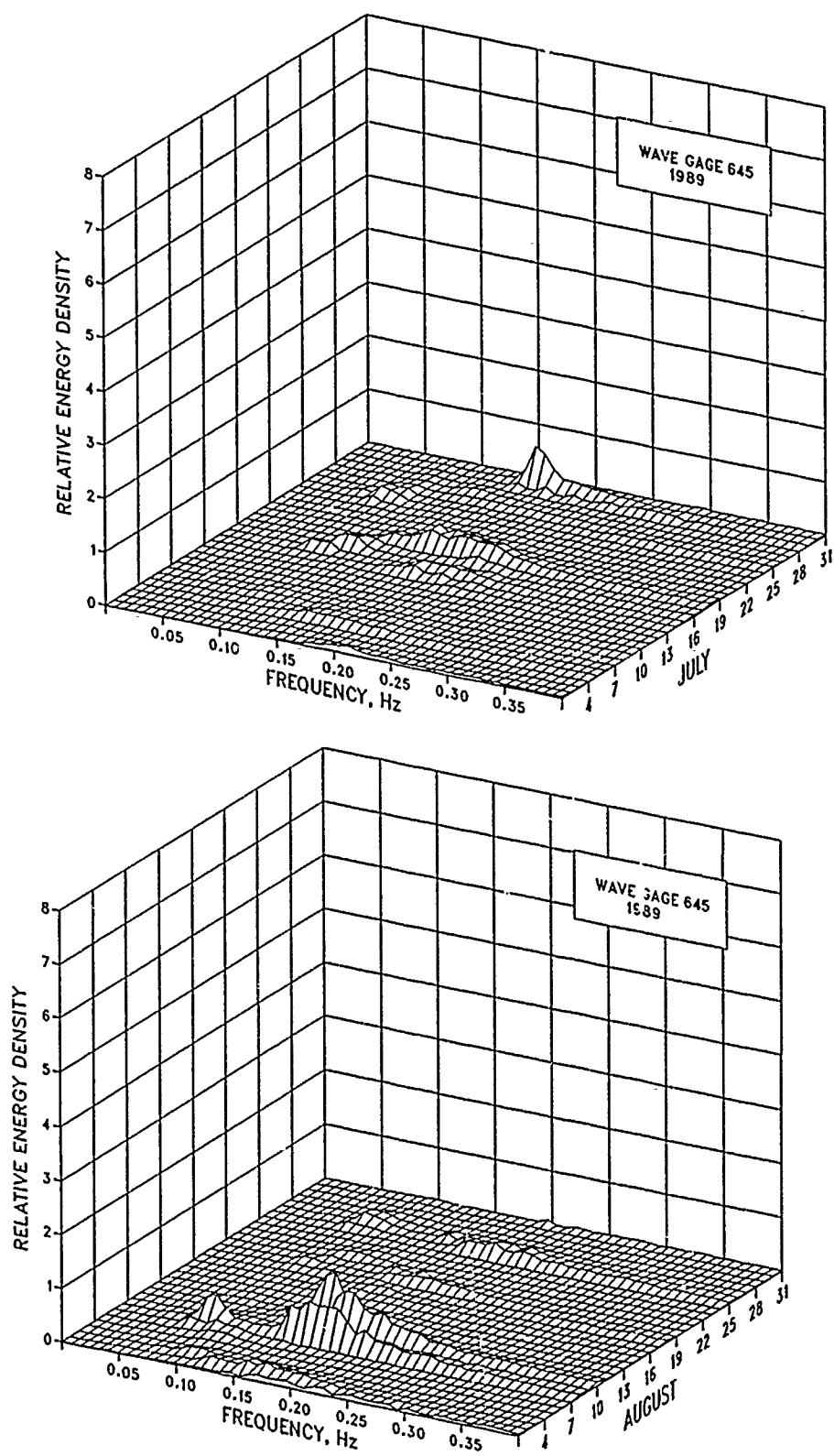


Figure E8. (Sheet 4 of 6)

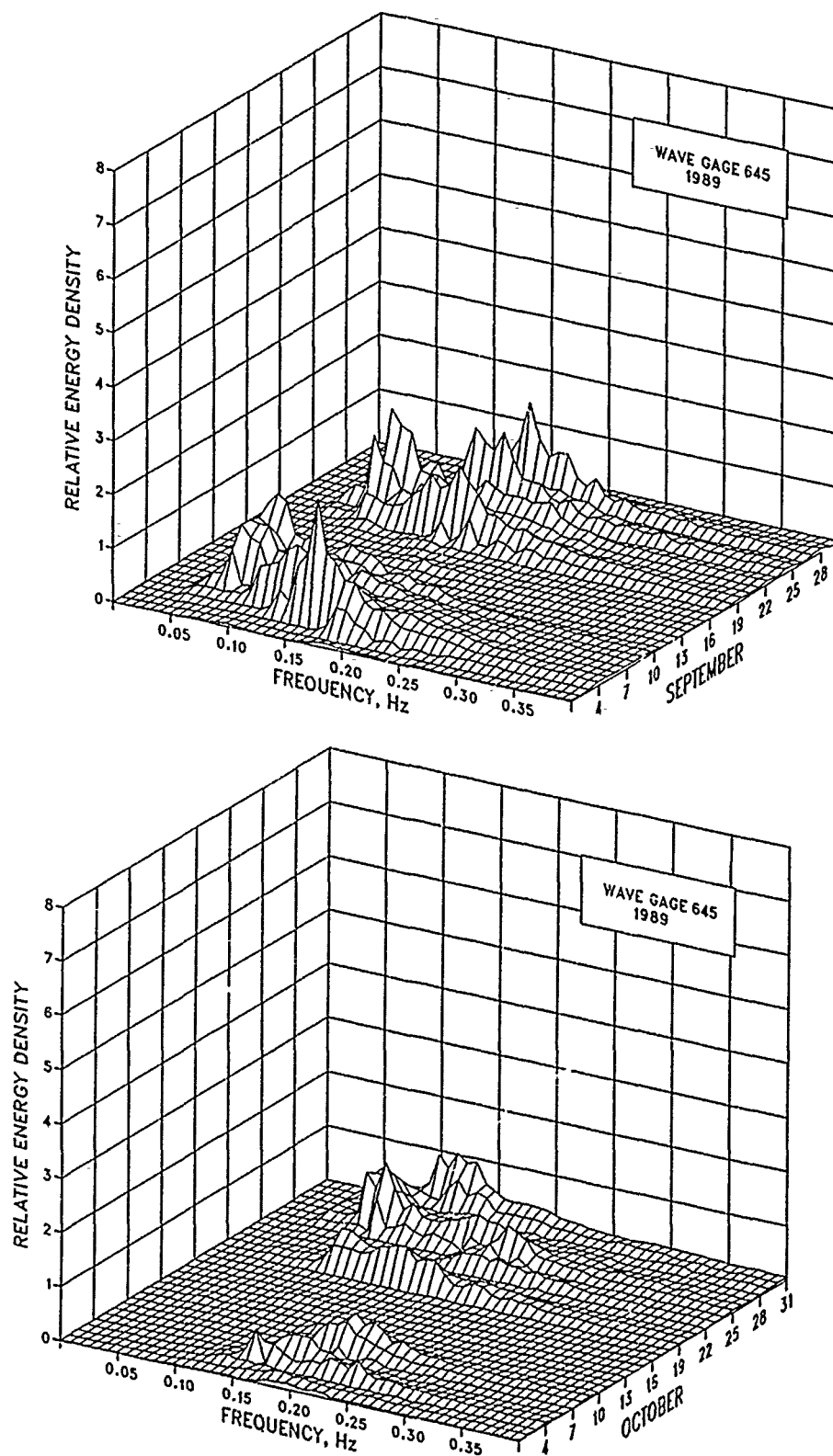


Figure E8. (Sheet 5 of 6)

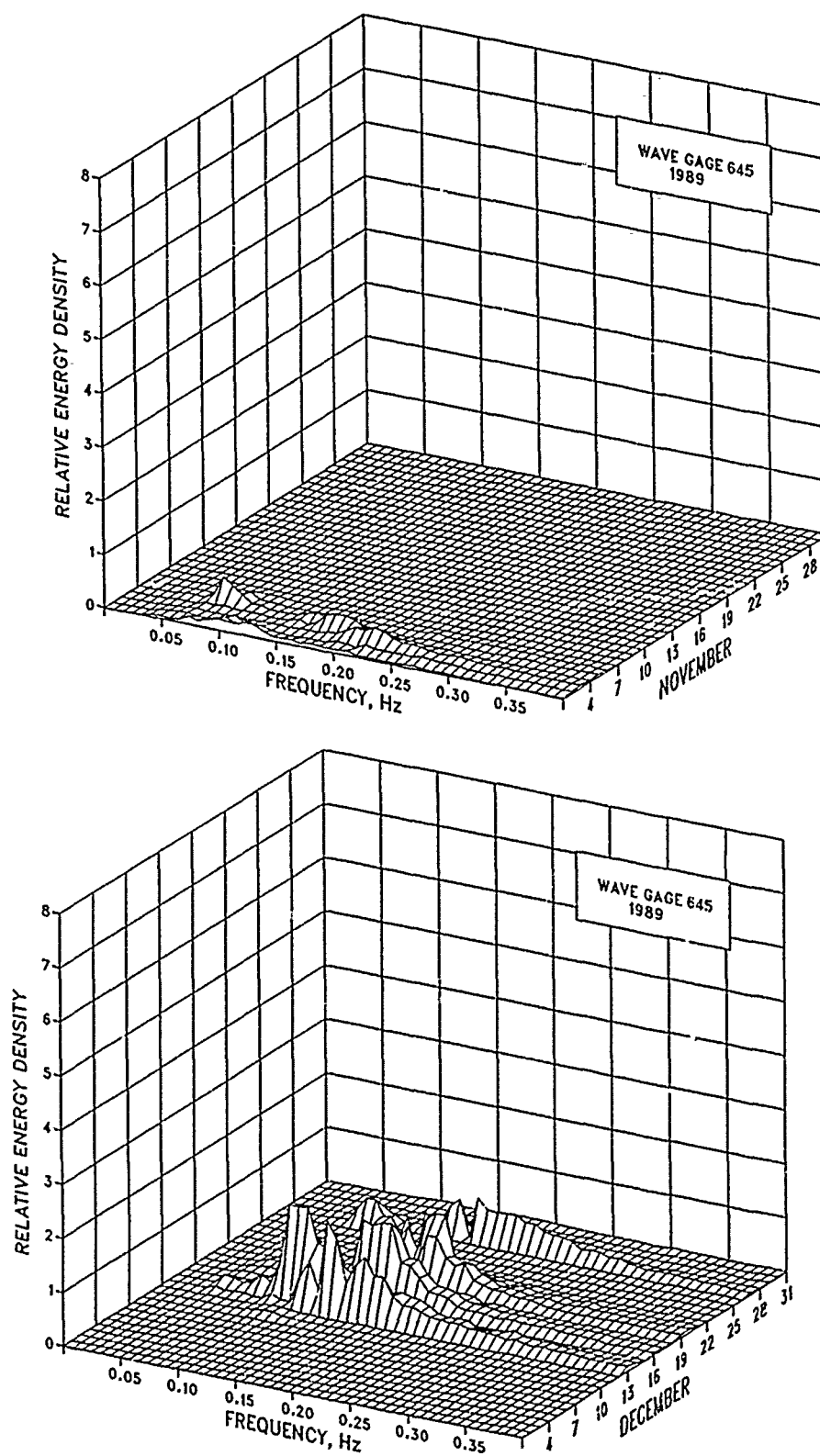


Figure E8. (Sheet 6 of 6)

Table E7
Wave Statistics for Gage 645

Month	1989							1980-1989						
	Height			Date	Period			Height			Date	Period		
	Mean	Std.	Extreme		Mean	Std.	Number	Mean	Std.	Extreme		Mean	Std.	Number
		Dev.				Dev.			Dev.				Dev.	
		m				m			m				sec	
Jan	0.7	0.3	1.3	21	8.2	3.1	117	0.8	0.4	2.0	1980	7.9	3.2	1034
Feb	0.8	0.4	1.5	24	7.6	2.6	100	0.8	0.4	2.0	1983	8.1	3.2	1003
Mar	0.9	0.6	1.9	8	8.2	2.8	119	0.8	0.5	2.3	1980	8.2	3.3	1119
Apr	0.7	0.4	1.6	11	7.6	2.9	115	0.7	0.4	2.3	1987	8.5	3.3	1025
May	0.5	0.3	1.5	28	9.3	3.9	123	0.6	0.4	2.0	1987	8.1	3.2	1090
Jun	0.4	0.2	0.9	30	7.2	2.3	115	0.5	0.3	1.6	1987	7.6	3.1	1058
Jul	0.4	0.2	1.0	18	8.3	3.4	120	0.5	0.2	1.3	1985	8.1	3.2	1082
Aug	0.5	0.3	1.4	8	8.1	2.6	120	0.6	0.3	1.7	1982	7.8	2.9	1109
Sep	1.0	0.5	1.9	24	9.1	3.7	117	0.7	0.4	2.1	1985	8.6	3.3	1053
Oct	0.8	0.4	1.5	25	7.7	3.2	82	0.8	0.5	2.2	1982	8.7	3.3	1090
Nov	0.7	0.2	0.9	3	8.6	3.5	23	0.8	0.4	2.0	1981	8.3	3.5	1009
Dec	0.8	0.5	2.2	13	7.2	3.1	50	0.7	0.4	2.2	1989	8.2	3.6	1037
Annual	0.7	0.4	2.2	Dec	8.1	3.2	1201	0.7	0.4	2.3	Apr 1987	8.2	3.3	12709

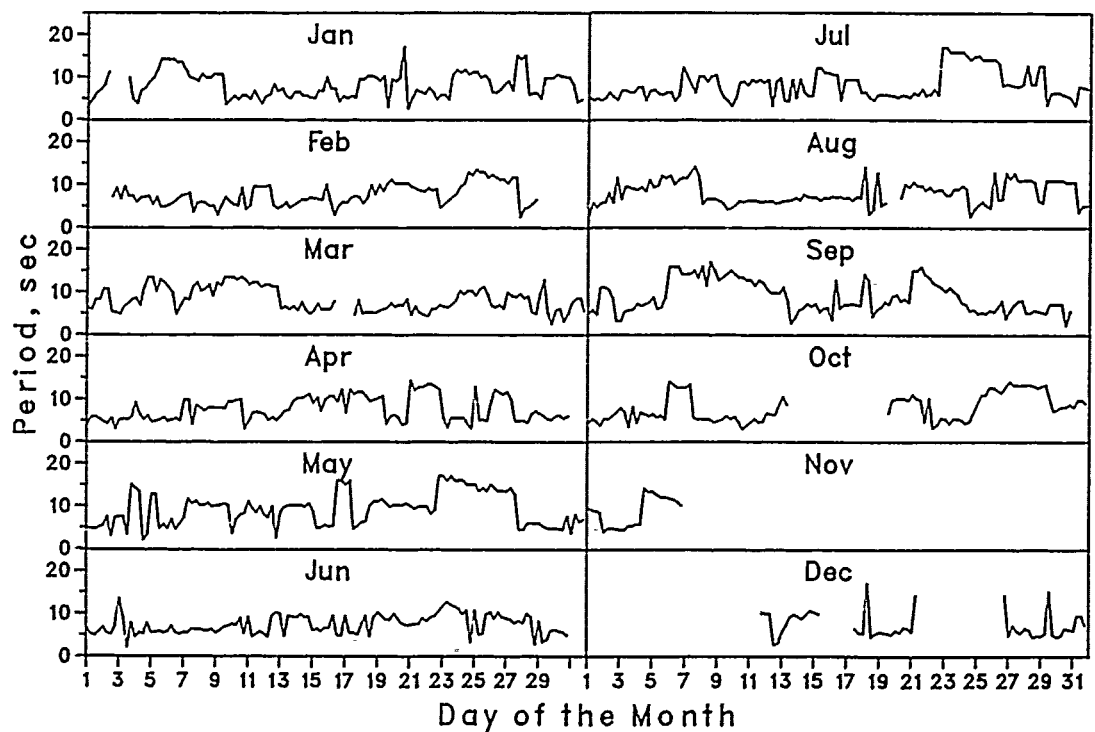
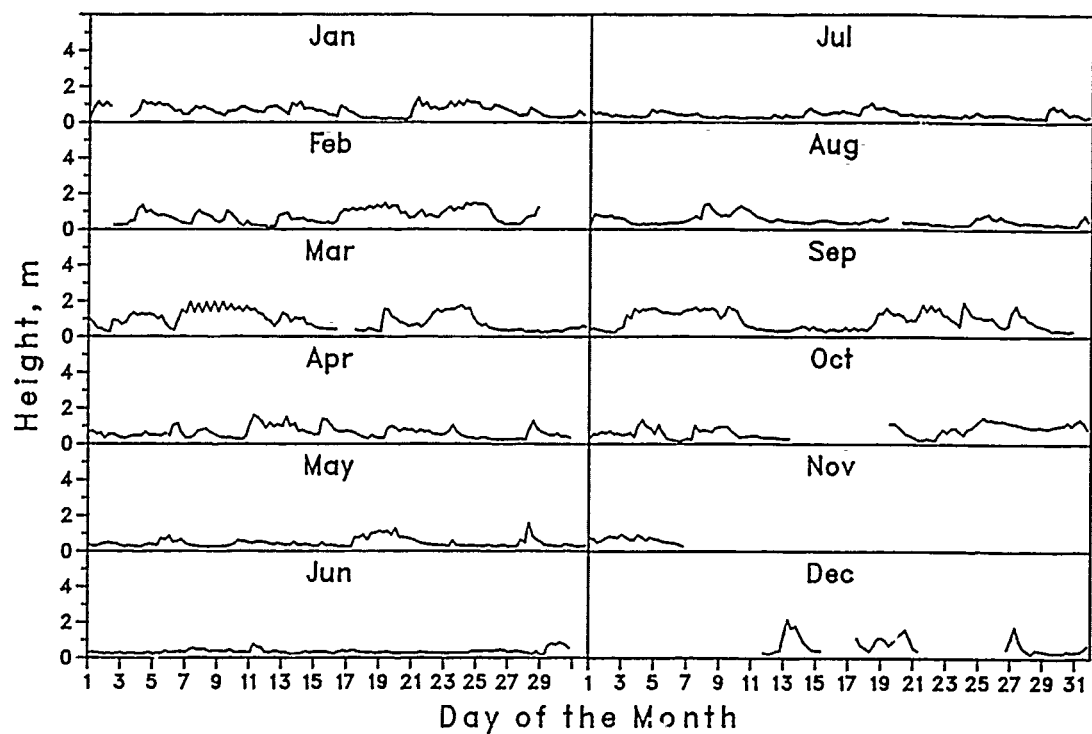


Figure E9. Time-histories of wave height and period
for Gage 645